4 OHIO RIVER BASIN

5 MARVIN CREEK, McKEAN COUNTY

6 PENNSYLVANIA

LEVEL II

2 HAMLIN LAKE PARK DAM

3 (NDI ID NO. PA-1014
DER ID NO. 42-17)

7 BOROUGH OF SMETHPORT

8 PHASE I INSPECTION REPORT

1 NATIONAL DAM INSPECTION PROGRAM

Prepared By

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG, PENNSYLVANIA
15931

FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF ENGINEERS
BALTIMORE, MARYLAND
21203

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AUGUST 1981

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MARVIN CREEK, McKEAN COUNTY

PENNSYLVANIA

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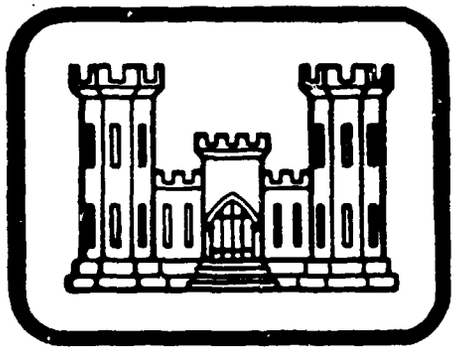

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Contract DACW31-81-C-0012

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relati e spillway capacity and serves as an aid in detemining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM INSPECTION REPORT

NAME OF DAM	Hamlin Lake Park Dam
STATE LOCATED	Pennsylvania
COUNTY LOCATED	McKean
STREAM	Marvin Creek
DATE OF INSPECTION	June 16, 1981
COORDINATES	Lat: 41° 48.5' Long: 78° 26'

ASSESSMENT

The assessment of Hamlin Lake Park Dam is based upon visual observations made at the time of inspection, review of available records and data, hydraulic and hydrologic computations and past operational performance.

Hamlin Lake Park Dam appears to be in fair condition. Maintenance at the facility is conducted on an unscheduled, as-needed basis. A close examination of the concrete gravity section could not be made due to discharges over the spillway. Minor debris was observed in the spillway discharge channel due to recent heavy rainfall.

Hamlin Lake Park Dam is a high hazard-small size dam. The recommended spillway design flood (SDF) for a dam of this size and classification, is in the range of 1/2 PMF to PMF. Based on the height of dam, storage capacity of the reservoir, and flow capacity of Marvin Creek the spillway design flood has been selected as the 1/2 PMF. Hamlin Lake Park Dam is capable of controlling approximately 9% of the PMF without overtopping the earthen embankment section.

The breach analysis and downstream routing of the flood wave does not indicate an increased potential for loss of life from that which existed just prior to failure of the dam due to overtopping. Therefore, the spillway is termed inadequate, but not seriously inadequate.

The following recommendations and remedial measures should be instituted immediately.

1. A detailed hydrologic and hydraulic analysis should be conducted by a registered professional engineer knowledgeable in dam design and analysis to increase the spillway capacity. The hyraulic and hyrologic analysis should include an evaluation of the downstream bridge and the capability of the channel to discharge required flows.

2. A more detailed inspection of the gravity spillway should be made as soon as low water conditions enable such an inspection. The

inspection should be conducted by a registered professional engineer knowledgeable in dam design and analysis. Modifications to the structure should be completed as soon as possible if required as a result of the inspection.

(3) A regularly scheduled maintenance and operating plan should be prepared and implemented to insure the continued safe operation of the structure.

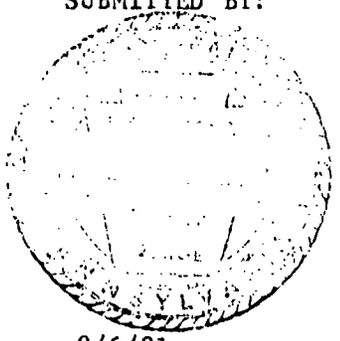
(4) A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

(5) A safety inspection program should be implemented with inspection at regular intervals by qualified personnel.

(6) The debris in the discharge channel should be removed as soon as possible. Future collection of the debris in the channel should be removed as soon as conditions in the channel allow for such work to be completed.

SUBMITTED BY:

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS AND ARCHITECTS



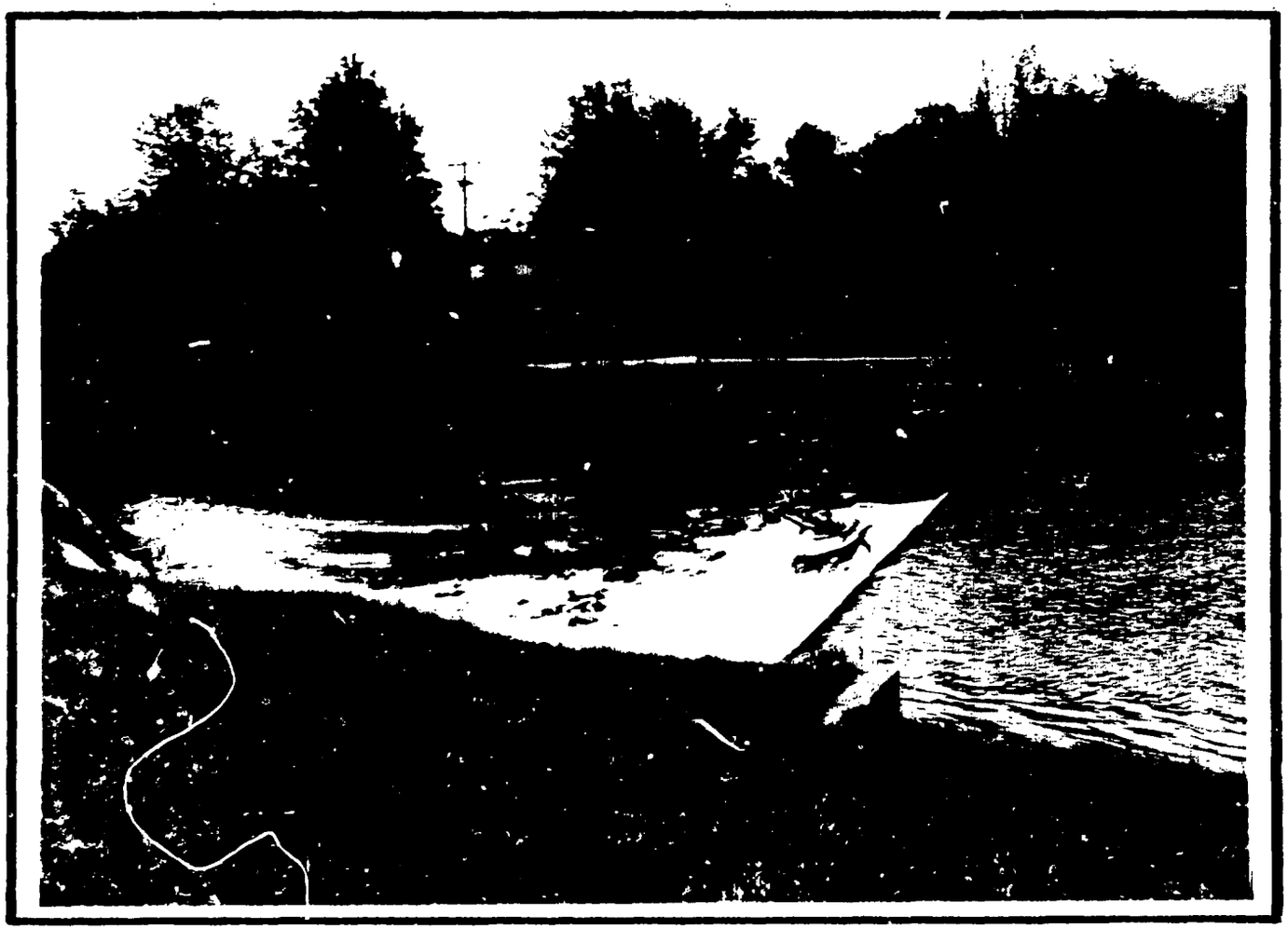
8/6/81
Date

R. Jeffrey Kimball, P.E.

APPROVED BY:

23 Aug 81
Date

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer



Overview of Hamlin Lake Park Dam

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APPENDICES

PHASE I
NATIONAL DAM INSPECTION PROGRAM

HAMLIN LAKE PARK DAM
NDI. I.D. NO. PA 1014
DER I.D. NO. 42-17

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Hamlin Lake Park Dam is an earthfill dam with a concrete gravity spillway. The earth embankment section is approximately 400 foot long and 10 feet high. The earth embankment section forms the left abutment of the gravity spillway. The crest width of the earth section of the dam is 10 feet. Both the upstream and downstream slopes of the embankment are 2.5H:1V.

The spillway for the dam consists of a concrete gravity ogee section and a 40 feet long sharp crested overflow section at the right abutment. The crest length of the ogee section is 215 feet, and the effective crest length of the overflow section at the right abutment is 31.5 feet. The overflow section at the right abutment is equipped with wooden flashboards capable of lowering the reservoir pool.

Paved roadways exist on both abutments of the structure. A reinforced concrete bridge exists immediately downstream of the spillway.

b. Location. The dam is located on Marvin Creek, in the Borough of Smethport, McKean County, Pennsylvania. The Hamlin Lake Park Dam can be located on the Smethport, PA, U.S.G.S. 7.5 minute quadrangle.

c. Size Classification. Hamlin Lake Park Dam is a small size dam (10 feet high, 144 acre-feet).

d. Hazard Classification. Hamlin Lake Park Dam is a high hazard dam. Downstream conditions indicate that loss of more than a

few lives is probable should the structure fail. The dam is located in the Borough of Smethport. A factory exists immediately beyond the downstream toe of the earthen embankment section, and a trailer park is located approximately 1/2 mile downstream of the dam.

e. Ownership. The Hamlin Lake Park Dam is owned by the Borough of Smethport. Correspondence should be addressed to:

The Borough of Smethport
412 West Waterstreet
Smethport, Pennsylvania 16749
814/887-5815

f. Purpose of Dam. The Hamlin Lake Park Dam is used for recreation and fire protection.

g. Design and Construction History. Based on information contained in the PennDER files, the Hamlin Lake Park Dam was constructed sometime prior to 1915. Several significant modifications have been made to the dam and spillways in the period since 1915. Ownership of the dam has changed several times. The dam was originally constructed to furnish power to a mill located at the right abutment of the dam. The mill was later abandoned and an American Legion Post secured the property for recreational purposes. In 1929 a permit was issued to the Post for the reconstruction of the dam. During a 1942 flood, a section of the dam was washed out. In 1942 the Borough of Smethport applied for a permit to reconstruct a portion of the dam. It was determined that the existing spillway capacity was inadequate. A section of the dam was reported to have failed again in 1955.

On July 10, 1958, the Borough of Smethport again filed an application for a permit to increase the spillway capacity. Modifications to the structure were completed in November 1960.

The most recent modifications to the dam were designed by Mr. C.L. Lorah. No information was available relative to the actual construction completed at that time. The present day facility appears to have been the result of the 1958 modifications to the structure.

h. Normal Operating Procedures. The reservoir is maintained for the purposes of recreation and as a water supply for fire protection.

1.3 Pertinent Data.

a. Drainage Area. 56.7 square miles

b. Discharge at Dam Site (cfs).

Maximum flood at dam site (July 17-18, 1942)	35,000
Spillway capacity at top of dam	3,050

c. Elevation (MSL) (feet). - Field survey based on an assumed spillway crest elevation, 1470.0 (estimated from U.S.G.S. 7.5 minute quadrangle).

Top of dam - low point	1472.3
Top of dam - design height	Unknown
Maximum pool - design surcharge	Unknown
Normal pool	1470.0
Spillway crest	1470.0
Streambed at centerline of dam	Unknown
Maximum tailwater	Unknown
Toe of dam	1462.0

d. Reservoir (feet).

Length of maximum pool	5000
Length of normal pool	4500

e. Storage (acre-feet).

Normal pool	74
Top of dam	144

f. Reservoir Surface (acres).

Top of dam	34.0
Normal pool	27.6
Spillway crest	27.6

g. Dam.

Type	Earthfill with concrete gravity and sharp crested overflow section
Length (excluding spillway)	400 feet
Height	10 feet
Top width	10 feet
Side slopes - upstream	2.5H:1V
- downstream	2.5H:1V
Zoning	None known
Impervious core	Unknown
Cutoff	Unknown
Grout curtain	Unknown

h. Reservoir Drain.

Type	Removable stoplogs in overflow section at right abutment
Length	N/A
Closure	Stop logs
Access	Right abutment
Regulating facilities	Stop logs

i. Spillway.

Type	Concrete gravity and sharp crested overflow section
Length of crest (total)	252.5 feet
Crest elevation	1470.0
Upstream channel	Lake (unrestricted)
Downstream channel	Marvin Creek

SECTION 2
ENGINEERING DATA

2.1 Design. Review of available information in the files of the Commonwealth of Pennsylvania, Department of Environmental Resources, revealed that some correspondence, permit information, pictures and several drawings of the dam were available for review. All information was reviewed for this study. The Borough of Smethport was unable to provide any additional information. Reference elevation of plan shown in Appendix E is unknown.

2.2 Construction. The Hamlin Lake Park Dam was constructed sometime prior to 1915. The dam has undergone several modifications since that time but, no detailed information exists relative to construction associated with the modifications.

2.3 Operation. The Hamlin Lake Park Dam is used for the purposes of recreation and water supply for fire protection. No planned operational procedures exist for the dam.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Pennsylvania Department of Environmental Resources, Bureau of Dams and Waterway Management.

b. Adequacy. This Phase I Report is based on the visual inspection, hydrologic and hydraulic analysis, and available data. Sufficient information exists to complete a Phase I Report.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The onsite inspection of Hamlin Lake Park Dam was conducted by personnel of L. Robert Kimball and Associates on June 16, 1981. The inspection consisted of:

1. Visual inspection of the retaining structure, abutments and toe,
2. Examination of the spillway facilities, exposed portion of any outlet works and other appurtenant works.
3. Observations affecting the runoff potential of the drainage basin.
4. Evaluation of the downstream area hazard potential.

b. Dam. The dam appears to be in fair condition. From a brief survey conducted during the inspection, it was determined that the low spot on the embankment crest exists near the left abutment of the spillway at the junction of the spillway and the embankment. The top width of the embankment is 10 feet. The upstream and downstream slopes are approximately 2.5H:1V. The crest of the dam is grass covered and no trees or brush were observed on the slopes.

No seepage or erosion was observed on the earth embankment section. No obvious settlement or sloughing of the embankment slopes were observed.

c. Appurtenant Structures. The spillway for the Hamlin Lake Park Dam consists of a concrete ogee gravity section with a sharp crested overflow section at the right abutment. The crest length of the ogee section is 215 feet. The effective crest length of the sharp crested overflow section at the right abutment is 31.5 feet. It was noted during the inspection that the spillway has been modified several times. Modifications to the spillway has included increasing the spillway length in a northerly direction. The section of the spillway near the right abutment consists of a concrete structure with 4 piers used to retain flashboards. A metal walkway exists across the overflow section and supplies access to the flashboards. A minor amount of debris was observed on the apron for the ogee section. The debris was due to recent heavy rains in the area. No major deficiencies were observed relative to the spillway.

The discharge channel for the Hamlin Lake Park Dam becomes relatively narrow approximately 150 feet downstream of the dam. A concrete reinforced bridge with culvert exists at this location. The opening beneath the bridge is approximately 84 feet wide and 13 feet high. The opening is arch shaped.

d. Reservoir Area. The reservoir slopes were observed to be moderate and not susceptible to massive landslides which would affect the storage volume of the reservoir or overtopping of the dam by displacing water.

e. Downstream Channel. The downstream channel for the Hamlin Lake Park Dam is relatively wide for a distance of approximately 3,000 feet, at which point Marvin Creek discharges into the Potato Creek. A factory exists immediately beyond the downstream toe of the dam and a trailer park is located approximately 1/2 mile downstream of the dam.

3.2 Evaluation. The earthen embankment section of the dam to the left of the spillway appeared to be in good condition. No seepage or erosion were observed on the embankment.

The spillway appeared to be in fair condition. No major deficiencies were observed relative to the spillways.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures. No planned operational procedures exist for this dam.

4.2 Maintenance of the Dam. No planned maintenance schedule exists for the dam. Maintenance of the dam is conducted on an unscheduled, as-needed basis.

4.3 Maintenance of Operating Facilities. No planned maintenance schedule exists for the operating facilities. Maintenance of the overflow section at the right abutment is completed on an unscheduled, as-needed basis.

4.4 Warning System in Effect. There is no warning system in effect to warn downstream residents of large spillway discharges or imminent failure of the dam.

4.5 Evaluation. The condition of the Hamlin Lake Park Dam is considered fair. There is no planned maintenance or operational procedures. A planned maintenance and operations procedures program should be prepared and implemented.

An emergency action plan should be available for every dam in the high and signficant hazard categories. Such plans should outline actions to be taken by the operator to minimize downstream effects of an emergency, and should include an effective warning system. An emergency action plan has not been developed, and the owner should develop such a plan.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. Design Data. No detailed hydrologic and hydraulic calculations were available relative to the design of the present spillway. The spillway has been modified several times since construction.

b. Experience Data. No rainfall, runoff or reservoir level data were available. Information obtained from a Department of the Army Publication No. ER 1110-2-106 (September 26, 1979) indicates that a 1942 storm centered on the Smethport area approached the magnitude of the PMF.

c. Visual Observations. The spillway appeared to be in fair condition. A close inspection of the structure could not be made due to flow over the spillway. The spillway discharge channel narrows significantly approximately 150 feet downstream of the spillway. A reinforced concrete bridge exists 150 feet downstream of the dam. The bridge and channel appeared to be capable of discharging flows from the spillway.

The top of dam was considered to be the elevation at the top of the left spillway abutment, at the junction of the spillway and embankment.

d. Overtopping Potential. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version systemized computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July 1978. The major methodologies or key input data for this program are discussed briefly in Appendix D.

5.2 Evaluation Assumptions. To enable completion of the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. The pool elevation prior to the storm was assumed to be at spillway crest elevation, 1470.0.

2. The top of dam was considered to be the elevation at the top of the left spillway abutment, at the junction of the spillway and dam, elevation 1472.3.

3. No upstream dams were considered during the analysis.

4. A reinforced concrete bridge located approximately 150 foot downstream of the dam was not considered as significantly affecting flow in the discharge channel.

5.3 Summary of Overtopping Analysis. Complete summary sheets for the computer output are presented in Appendix D.

Peak inflow (1/2 PMF)	17564 cfs
Spillway capacity	3050 cfs

a. Spillway Adequacy Rating. The Spillway Design Flood (SDF) for a dam of this size and classification is in the range of 1/2 PMF to PMF. No definitive criteria exists to assist the evaluating engineer in selecting the spillway design flood within the given range. The current practice adopted by the Baltimore District Corps of Engineers relates the selection of a spillway design flood to the size and storage potential of the dam.

Hamlin Lake Park Dam is a relatively low dam. The maximum storage potential (when considering the low spot on the embankment crest) is small when considering the flow capacity of Marvin Creek. Based on the height of dam, storage capacity of the reservoir, and flow capacity of Marvin Creek the spillway design flood has been selected as the 1/2 PMF.

Based on the following definition provided by the Corps of Engineers, the spillway is rated as inadequate as a result of our hydrologic analysis.

> Inadequate - All high hazard dams which do not pass the spillway design flood (1/2 PMF).

The spillway and reservoir are capable of controlling approximately 9% of the PMF without overtopping the embankment low spot.

5.4 Summary of Dam Breach Analysis. As the subject dam cannot satisfactorily pass 50% of the PMF, it was necessary to perform a dam breach analysis, and downstream routing of the flood wave. This analysis determines the degree of increased flooding due to dam failure. A pool elevation of 1473.3 (representing 1 foot of overtopping) was considered sufficient to cause failure of the dam due to overtopping.

The results of the dam breach analysis indicate that the downstream potential for loss of life and property damage is not increased by dam failure. Therefore, the spillway is rated as inadequate, but not seriously inadequate. Details of the downstream routing of the flood wave are included in Appendix D.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. No major deficiencies were observed during the inspection, and no major erosion areas were observed on the earthen embankment section or in the area of the ogee section. Flow over the crest of the spillway hampered attempts of close visual inspection of the structure. No seepage was observed on the downstream slope of the embankment or along the toe area.

b. Design and Construction Data. Only limited information regarding the design of the concrete gravity section and earthen embankment were available in the DER files. No construction data were available for review. The most recent modification appears to have been completed sometime around 1958. The modifications completed at that time included the lengthening of the spillway and the construction of a dike along the left edge of the spillway discharge channel.

c. Operating Records. No operating records are maintained at the Hamlin Lake Park Dam.

d. Post Construction Changes. The most recent drawings available in the DER files indicate that the dam was modified in 1958. Information obtained from the 1958 drawings indicates that a spillway existed at the left abutment of the dam. The spillway has been apparently removed sometime since 1958. No information is available in the DER files relative to the removal of the spillway and repair of the earthen embankment in the area.

e. Stability Analysis. An approximate analysis of the static stability of the gravity section was performed for this study. During periods of extreme hydrolometeorological events, the weir could potentially become submerged and no stability analysis during this condition was considered necessary.

An approximate analysis of the static stability of the structure was made for this report. Calculations relative to the analysis appear in Appendix G of this report. The results of the analysis indicate that the gravity section is stable (F.S. = 1.58) when considering overturning about the downstream toe of the section. A factor of safety against sliding was determined to be (F.S. = 3.17). The resultant falls slightly outside the middle third, but the toe pressure is well within acceptable limits and the stability is considered adequate.

Based on the results of the stability analysis contained in Appendix G, a sufficient factor of safety exists for the concrete gravity section. No obvious signs of instability were noted during the inspection relative to the earth embankment section. The static sta-

bility of the earthen section is assumed to be adequate. No calculations were completed to document this assumption.

f. Seismic Stability. The dam is located in seismic zone 1. No seismic stability analyses have been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading. Based on the results of the stability analysis contained in Appendix G, the static stability of the dam is considered adequate. Therefore, the seismic stability is considered adequate.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The dam appears to be in fair condition. No seepage or erosion were observed in the area of the earthen embankment and spillway. No brush or trees were observed on the earthen embankment crest or slopes.

A close examination of the concrete gravity section could not be made due to discharges over the spillway. Minor debris was observed in the spillway discharge channel due to recent heavy rainfall. The concrete gravity section is considered to be marginally stable. No major deficiencies were observed relative to the earthen embankment which were considered as having an immediate effect on the stability of the embankment.

The Hamlin Lake Park Dam is a high hazard-small size dam. The spillway design flood for a dam of this size and classification is in the range of 1/2 PMF to PMF. No definitive criteria exists to assist the evaluating engineer in selecting the spillway design flood within the given range. The current practice adopted by the Baltimore District Corps of Engineers relates the selection of a spillway design flood to the size and storage potential of the dam.

Hamlin Lake Park Dam is a relatively low dam. The maximum storage potential (when considering the low spot on the embankment crest) is small when considering the flow capacity of Marvin Creek. Based on the height of dam, storage capacity of the reservoir, and flow capacity of Marvin Creek the spillway design flood has been selected as the 1/2 PMF.

The visual observations, review of available data, hydrologic and hydraulic computations and past operational performance indicate that the Hamlin Lake Park Dam is capable of controlling approximately 9% of the PMF without overtopping the earthen embankment section.

The breach analysis and downstream routing of the flood wave does not indicate an increased potential for loss of life from that which existed just prior to failure of the dam. Therefore, the spillway is termed inadequate, but not seriously inadequate.

b. Adequacy of Information. Sufficient information is available to complete a Phase I report.

c. Urgency. The recommendations suggested below should be implemented immediately.

d. Necessity for Further Investigation. In order to accomplish some of the recommendations/remedial measures outlined below, further investigations will be required.

7.2 Recommendations/Remedial Measures.

1. A detailed hydrologic and hydraulic analysis should be conducted by a registered professional engineer knowledgeable in dam design and analysis to increase the spillway capacity. The hyraulic and hyrologic analysis should include an evaluation of the downstream bridge and the capability of the channel to discharge required flows.

2. A more detailed inspection of the gravity spillway should be made as soon as low water conditions enable such an inspection. The inspection should be conducted by a registered professional engineer knowledgeable in dam design and analysis. Modifications to the structure should be completed as soon as possible if required as a result of the inspection.

3. A regularly scheduled maintenance and operating plan should be prepared and implemented to insure the continued safe operation of the structure.

4. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

5. A safety inspection program should be implemented with inspection at regular intervals by qualified personnel.

6. The debris in the discharge channel should be removed as soon as possible. Future collection of the debris in the channel should be removed as soon as conditions in the channel allow for such work to be completed.

APPENDIX A
CHECKLIST, VISUAL INSPECTION, PHASE I

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Hamlin Lake Park Dam COUNTY McKean STATE Pennsylania ID# PA 1014

TYPE OF DAM Earthfill HAZARD CATEGORY High

DATE(s) INSPECTION June 16, 1981 WEATHER Clear and warm TEMPERATURE 70°

POOL ELEVATION AT TIME OF INSPECTION 1470.0 M.S.L. TAILWATER AT TIME OF INSPECTION 1462.0 M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - L. Robert Kimball and Associates

James T. Hockensmith - L. Robert Kimball and Associates

O.T. McConnell - L. Robert Kimball and Associates

O.T. McConnell RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None noted.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None noted.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Appears to be all right.	
RIPRAP FAILURES	Not applicable.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Embankment crest and slopes are grass covered.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appear to be all right.	
ANY NOTICEABLE SEEPAGE	None.	
STAFF GAUGE AND RECORDER	None.	
DRAINS	None.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	None noted.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Appears to be all right.	
DRAINS	Not applicable.	
WATER PASSAGES	Not applicable.	
FOUNDATION	Unobserved.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	None observed during the inspection.	The gravity section could not be closely examined due to water over the structure.
STRUCTURAL CRACKING	None observed.	Structure could not be closely examined due to water over the section.
VERTICAL AND HORIZONTAL ALIGNMENT	Appears to be all right.	
MONOLITH JOINTS	Unobserved.	
CONSTRUCTION JOINTS	Unobserved.	
STAFF GAUGE OR RECORDER	None.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not applicable.	
INTAKE STRUCTURE	Not applicable.	
OUTLET STRUCTURE	Not applicable.	
OUTLET CHANNEL	Not applicable.	
EMERGENCY GATE	Not applicable.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The concrete gravity ogee section appeared to be in fair condition. A close examination of the structure could not be made.	
APPROACH CHANNEL	Lake [Unrestricted].	
DISCHARGE CHANNEL	Marvin Creek. A reinforced concrete bridge exists approximately 150 feet downstream of the dam. Channel appears to be adequate to discharge required flows.	
BRIDGE AND PIERS	One bridge located approximately 150 feet downstream of the spillway.	Drawings indicate that the opening under the bridge is 85 feet long by 13 feet high. Bridge opening observed to be arch shaped.

GATED SPILLWAY - NOT APPLICABLE

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES AND OPERATION EQUIPMENT	Not applicable.	

DOWNSTREAM CHANNEL

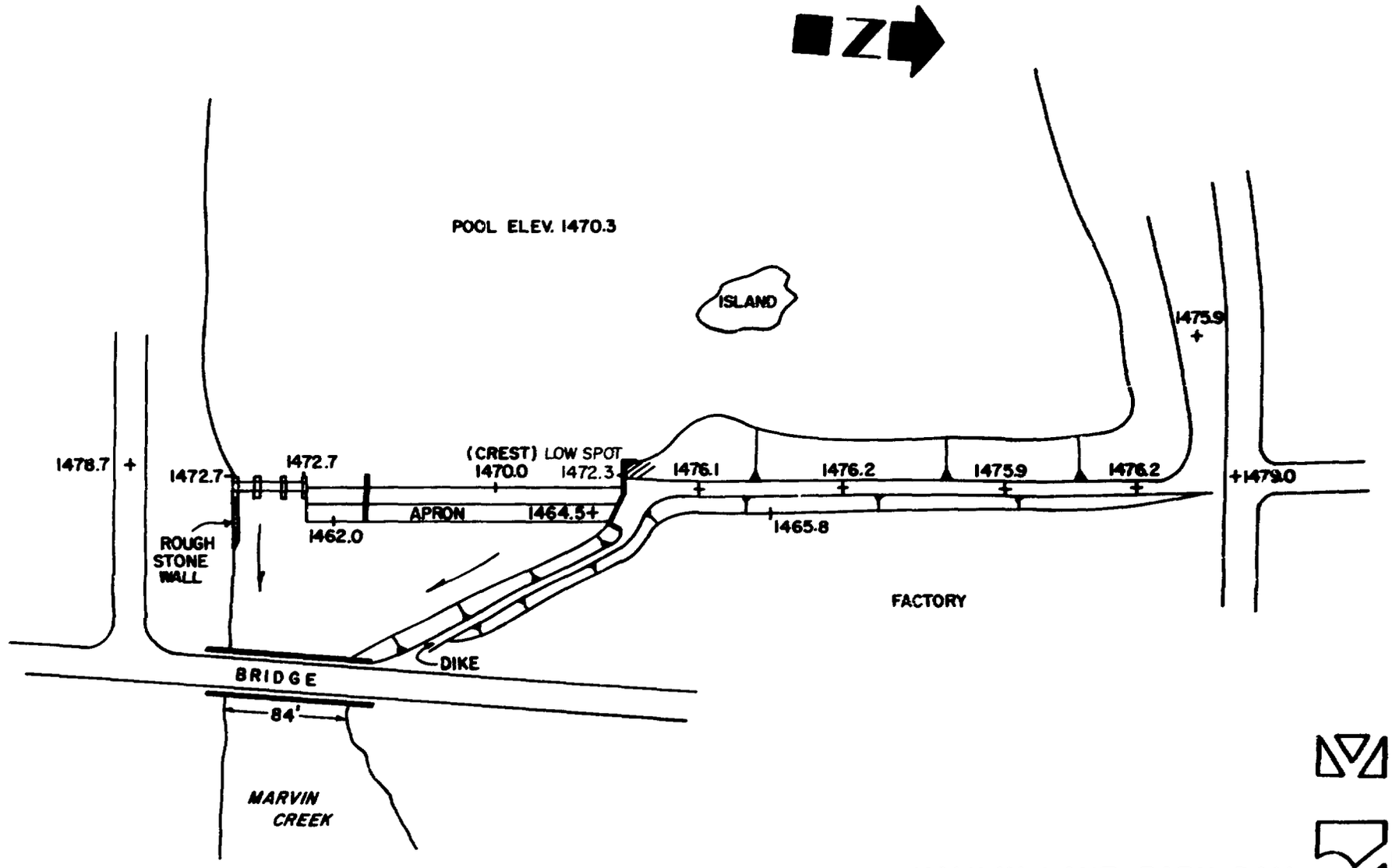
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The spillway discharge channel for the Hamlin Lake Park Dam consists of Marvin Creek. A reinforced concrete bridge exists approximately 150 feet downstream of the spillway. The opening in the bridge appeared to be sufficient to discharge required flows in the channel.	
SLOPES	Appear to be stable.	
APPROXIMATE NO. OF HOMES AND POPULATION	A factory exists immediately beyond the downstream toe of the earthen embankment section and a trailer court exists approximately 1/2 mile downstream of the dam. The population of the affected area is represented by the employees at the factory and the residents of the tailor court downstream is estimated to equal 50 people.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate.	
SEDIMENTATION	Unknown.	

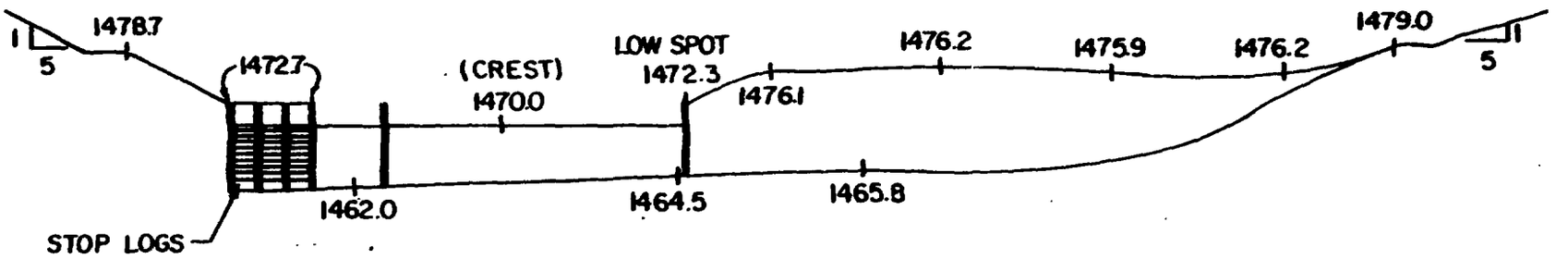
INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	



HAMLIN LAKE PARK DAM

SCALE: 1" = 100'



PROFILE
LOOKING UPSTREAM

SCALE: HORIZ. 1"= 100'
VERT. 1"= 20'

HAMLIN LAKE PARK DAM

APPENDIX B
CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION, PHASE I

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Hamlin Lake Park Dam

ID# PA 1014

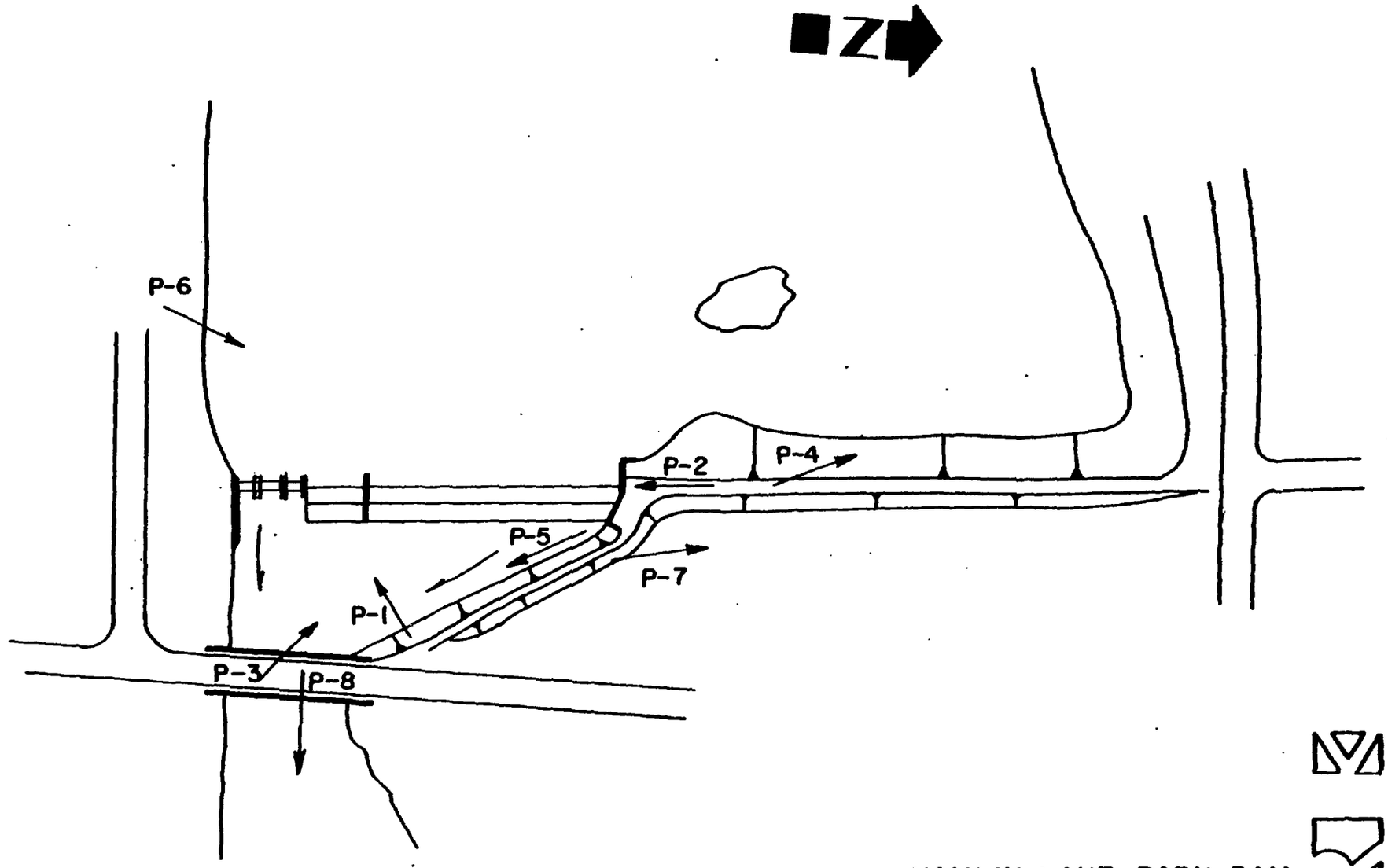
ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	U.S.G.S. quadrangle.
CONSTRUCTION HISTORY	Information available in DER files.
TYPICAL SECTIONS OF DAM	See Appendix E.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	See Appendix E. See Appendix E. None. None. None.

ITEM	REMARKS
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None. Limited data in DER files. None.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None.
POST-CONSTRUCTION SURVEYS OF DAM	None known to exist.
BORROW SOURCES	Unknown.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Several modifications have been completed relative to the earthen embankment section and spillway. Last known modification to the occurred sometime around 1958.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None known to exist.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Information in the DER files suggest that the dam has failed 2 times. Most recent failures of the structure occurred in 1942 and 1955 based on data in the DER files. No information exists relative to downstream damage.
MAINTENANCE OPERATION RECORDS	None.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	See Appendix E.
OPERATING EQUIPMENT PLANS & DETAILS	None.

APPENDIX C
PHOTOGRAPHS



C-1

HAMLIN LAKE PARK DAM
PHOTO INDEX

P-INDICATES PHOTO LOCATION

HAMLIN LAKE PARK DAM
PA 1014

Sheet 1

Front

(1) Upper left - View of overflow section at right abutment of the dam.
(2) Upper right - View across crest of spillway. View towards right abutment.
(3) Lower left - View of ogee section and partial view of junction of embankment and spillway.
(4) Lower right - View across the upstream slope of the dam. View towards the left abutment.

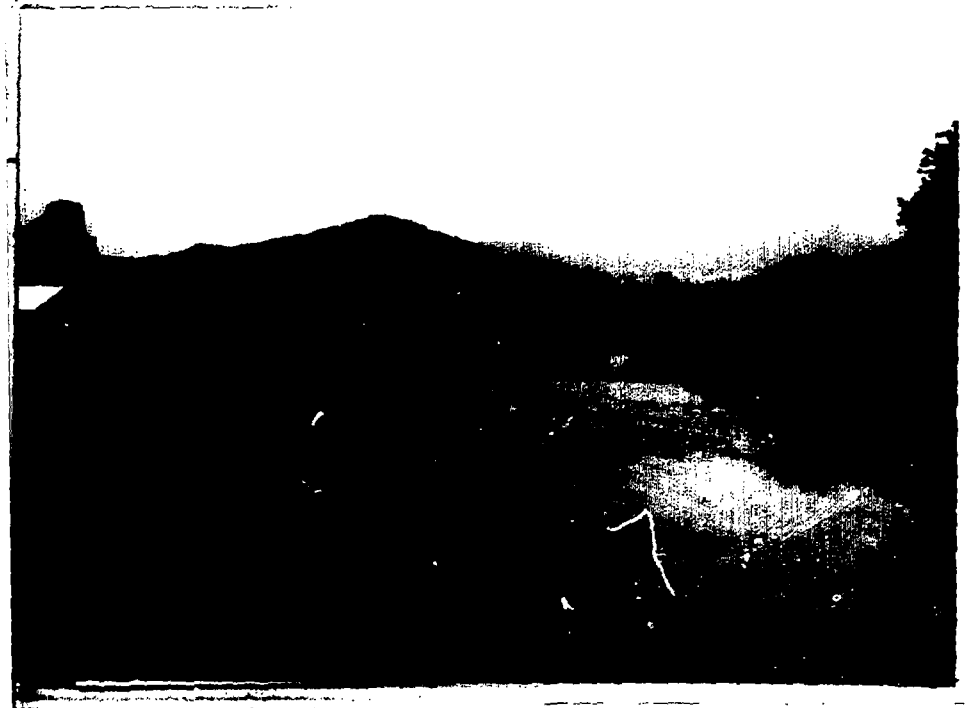
Sheet 1

Back

(5) Upper left - View of earth berm along discharge channel. Note highway bridge across discharge channel.
(6) Upper right - Partial view of spillway approach and earth embankment section. View towards the left abutment.
(7) Lower left - View of earthen embankment section from berm area. View towards the left abutment.
(8) Lower right - View of trailors located downstream of dam. View from highway bridge.

TOP OF PAGE

1,5	2,6
3,7	4,8



APPENDIX D
HYDROLOGY AND HYDRAULICS

APPENDIX D
HYDROLOGY AND HYDRAULICS

Methodology. The dam overtopping and breach analyses were accomplished using the systemized computer program HEC-1 (Dam Safety Investigation), September, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation. The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 33" prepared by the U.S. Weather Bureau.

The index rainfall may be reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters their definition and how they were obtained for these analysis.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel miles	From U.S.G.S. 7.5 minute topgraphic
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

3. Routing. Reservoir routing is accomplished by using Modified Plus routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input, or sufficient dimensions input, and the program will calculate an elevation discharge relationship.

Storage in the pool area is defined by an area - elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping. Using given percentages of the PMF, the computer program will calculate the percentage of the PMF, which can be controlled by the reservoir and spillway without the dam overtopping.

5. Dam Breach and Downstream Routing. The computer program is equipped to determine the increase in downstream flooding due to failure of the dam caused by overtopping. This is accomplished by routing both the pre-failure peak flow and the peak flow through the breach (calculated by the computer with given input assumptions) at a given point in time and determining the water depth in the downstream channel. Channel cross-sections taken from U.S.G.S. 7.5 minute topographic maps were used in the downstream flood wave routing. Pre and post failure water depths are calculated at locations where cross-sections are input.

HYDROLOGY AND HYDRAULICS ANALYSIS
DATA BASE

NAME OF DAM: Hamlin Lake Park Dam

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.8 inches

STATION	1	2	3
Station Description	Hamlin Lake		
Drainage Area (square miles)	56.7		
Cumulative Drainage Area (square miles)	56.7		
Adjustment of PMF for Drainage Area (%)[1]	(Zone 2)		
6 hours	94		
12 hours	103		
24 hours	116		
48 hours	126		
72 hours	N/A		
Snyder Hydrograph Parameters			
Zone[2]	23		
Cp[3]	0.55		
Ct[3]	3.30		
L (miles)[4]	15.0		
Lca (miles)[4]	8.0		
tp = $Ct(LxLca)^{0.3}$ hrs.	13.9		
Spillway Data			
Crest Length (ft)	252.50		
Freeboard (ft)	2.3		
Discharge Coefficient	3.2 overflow section	3.6 ogee section	
Exponent	1.5		

(1) Hydrometeorological Report 33 (Figure 1), U.S. Weather Bureau and U.S. Army Corps of Engineers, 1956.
(2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's coefficients (C_p and C_t).
(3) Snyder's Coefficients.
(4) L=Length of longest water course from outlet to basin divide.
L_{ca}=Length of water course from outlet to point opposite the centroid of drainage area.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 56.7 sq.mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1470.0 [74 ac-ft]

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1472.3 [144 ac-ft]

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1472.3 [low spot]

SPILLWAY CREST:

a. Elevation 1470.0
b. Type Concrete gravity ogee section & sharp crested overflow section
c. Width Not applicable
d. Length Total crest length = 252.5 feet
e. Location Spillover Right abutment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type Not applicable
b. Location Not applicable
c. Entrance inverts Not applicable
d. Exit inverts Not applicable
e. Emergency drawdown facilities Stop logs in overflow section

HYDROMETEOROLOGICAL GAUGES:

a. Type None
b. Location None
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

NOTE: Elevations refer to MSL.

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CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

NAME HANLIN LAKE POOL DAM
NUMBER PA-1014
SHEET NO. 1 OF 5
BY DTM DATE 6/81

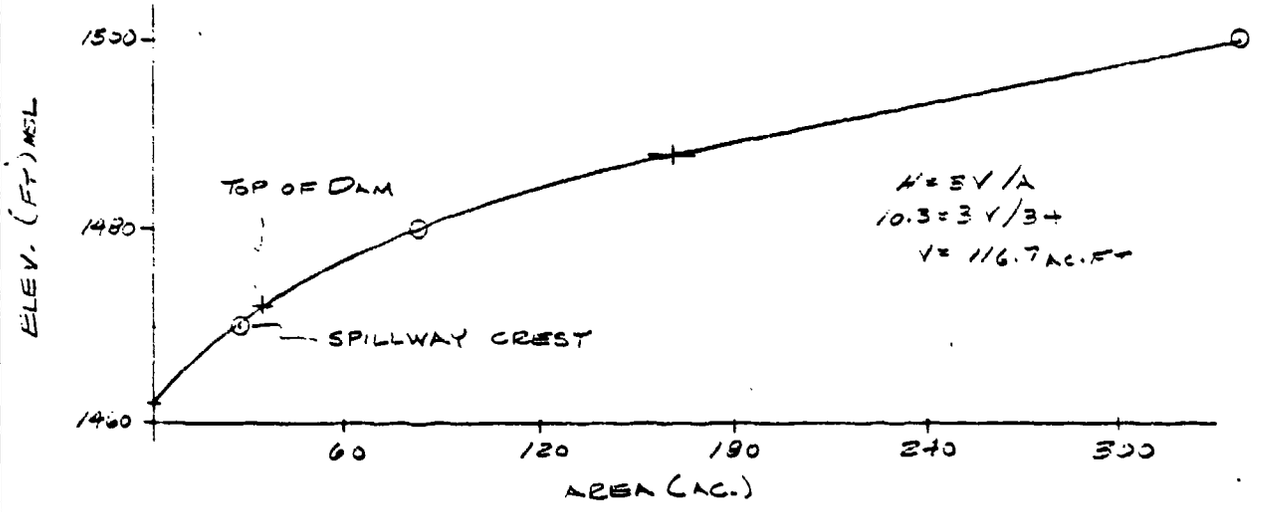
LOSS RATE AND BASE FLOW PARAMETERS

STRTL = 1 INCH
CNSTL = 0.05 IN/HR
STRTQ = 1.5 CFS/MI²
QRCSN = 0.05 (5% OF PEAK FLOW)
RTIOR = 2.0

ELEVATION-AREA-CAPACITY RELATIONSHIPS

FROM U.S.G.S. 7.5-MIN. QUAD., DER. FILES AND FIELD INSPECTION DATA.

SPILLWAY CREST AT ELEVATION = 1470.0
SURFACE AREA AT NORMAL POOL = 27.6 ACRES
ASSUME ZERO STORAGE AT ELEVATION = 1462.0
AT ELEV. 1480, AREA = 83 AC.
AT ELEV. 1500, AREA = 340 AC.



AREA (AC.)	0	27.6	34	83	162	340
ELEV. (FT.)	1462	1470	1472.3	1480	1488	1500

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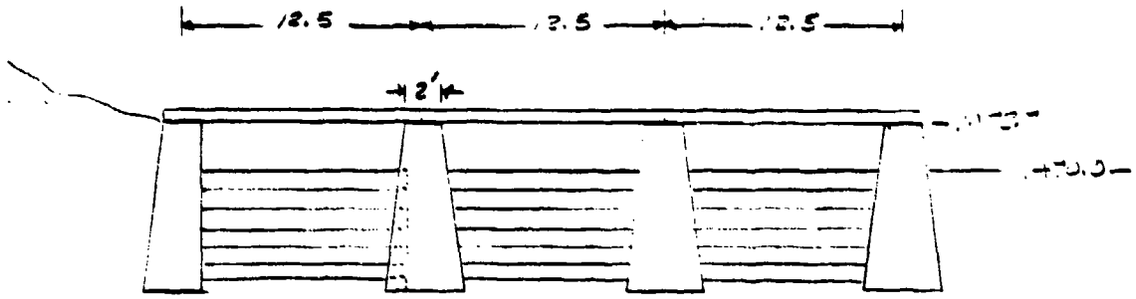
EBENSBURG PENNSYLVANIA

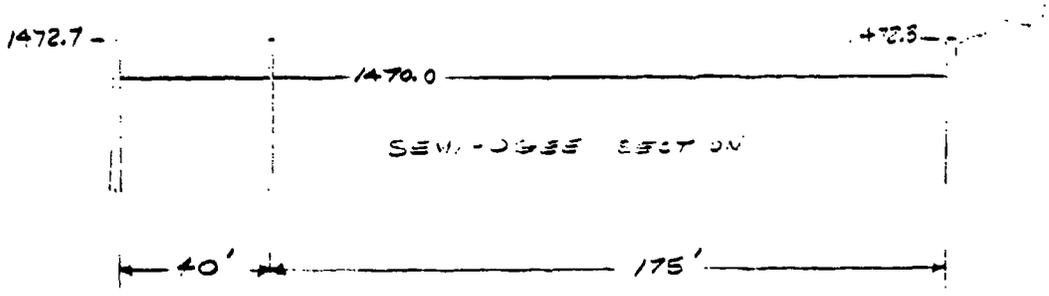
NAME
NUMBER PA-104
SHEET NO. 2 OF 5
BY OTM DATE 6/81

DISCHARGE RATING CURVE



EFFECTIVE CREST LENGTH (STOP LOGS) = L
NEGLECT FOOT-BRIDGE.
L = 37.5' - 6' = 31.5 @ ELEV. 470

$Q_1 = C_1 l_1 h^{3/2}$ USE $C = 3.2$, $l = 31.5'$, $h_{MAX} = 2.5'$



$Q_2 = C_2 l_2 h^{3/2}$ USE $C = 3.6$, $l = 215'$, $h_{MAX} = 2.5'$

$Q_{MAX} = Q_{1\,MAX} + Q_{2\,MAX}$

$= (3.2)(31.5)(2.3^{3/2} + (3.6)(215)(2.3)^{3/2}$

$= 351.6 + 2,699.8$

$= 3,051.4$ cfs

ELEV. (FT)	SHARP CREST		SEMI-OGEE		DISCHARGE *Q (cfs)
	h_1 (FT)	Q_1 (cfs)	h_2 (FT)	Q_2 (cfs)	
1470	0	0	0	0	0
1471	1	100	1	770	870
1472.3	2.3	350	2.3	2700	3050
1473	3	520	3	4020	4540
1474	4	810	4	6190	7000
1475	5	1130	5	8650	9780
1476	6	1480	6	11380	12860
1477	7	1870	7	14330	16200
1478	8	2280	8	17510	19790
1482	12	4190	12	32170	36360

* VALUES ROUNDED TO NEAREST 10 CFS.

OVERTOPPING

TO BE DETERMINED BY (HEC-1)

TOP OF DAM (LOW SPOT) AT ELEV. 1472.3
COEFFICIENT OF DISCHARGE (C) = 3.9 (SCUND CREST)

ℓ	10'	295'	340	710	810
ℓ	1472.3	1474	1476	1478	1480

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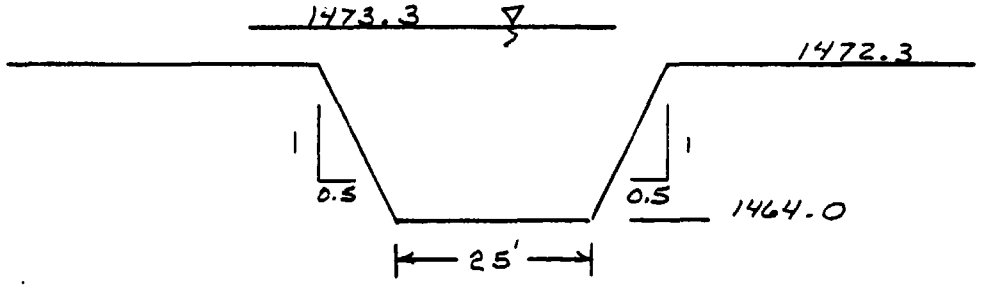
EBENSBURG PENNSYLVANIA

NAME
NUMBER PA-1014
SHEET NO. 4 OF 5
BY DGM DATE 7-81

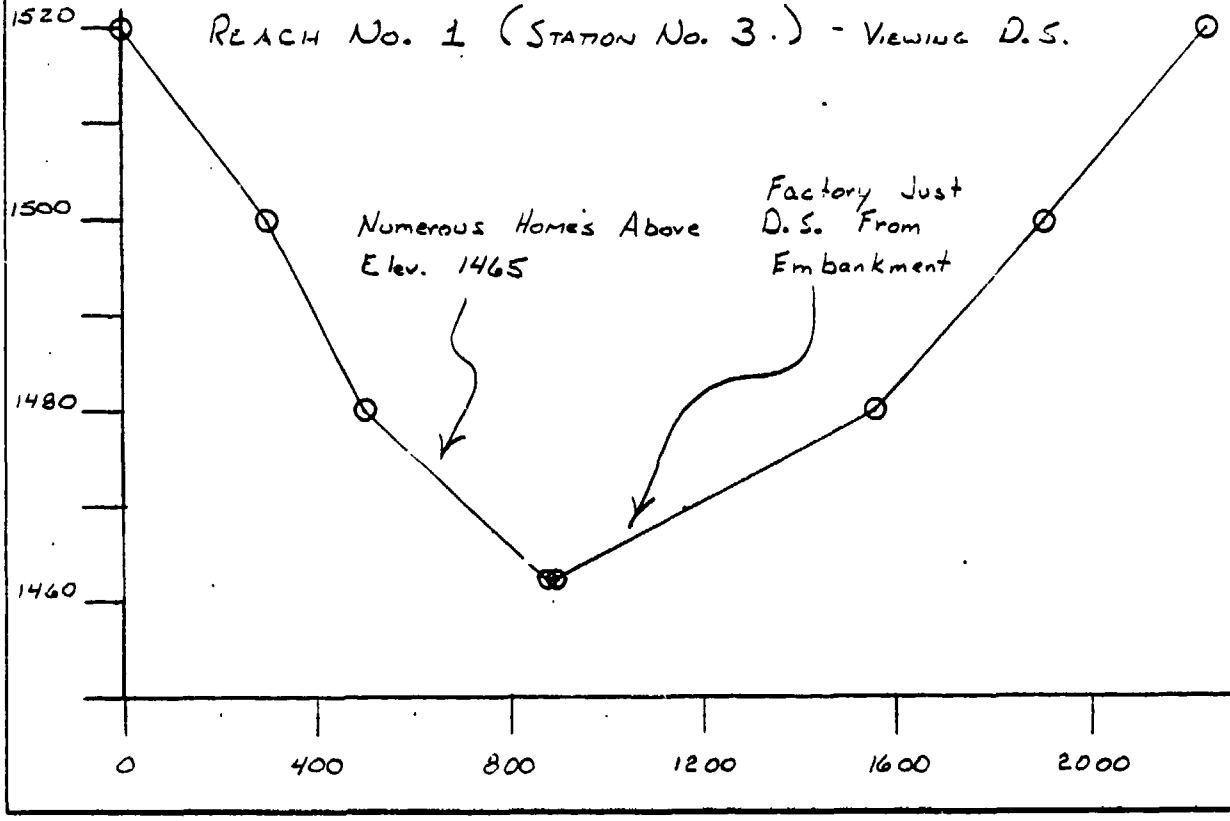
BREACH ANALYSIS



BRWID = 25'
Z = 0.5'
ELBM = 1464.0
TFAIL = 2 HRS.
WSEL = 1470.0
FAILEL = 1473.3

CONSIDER 1.0' OF OVERTOPPING SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE. DURATION OF OVERTOPPING WILL BE IN EXCESS OF 8 HRS.

FLOOD ROUTING



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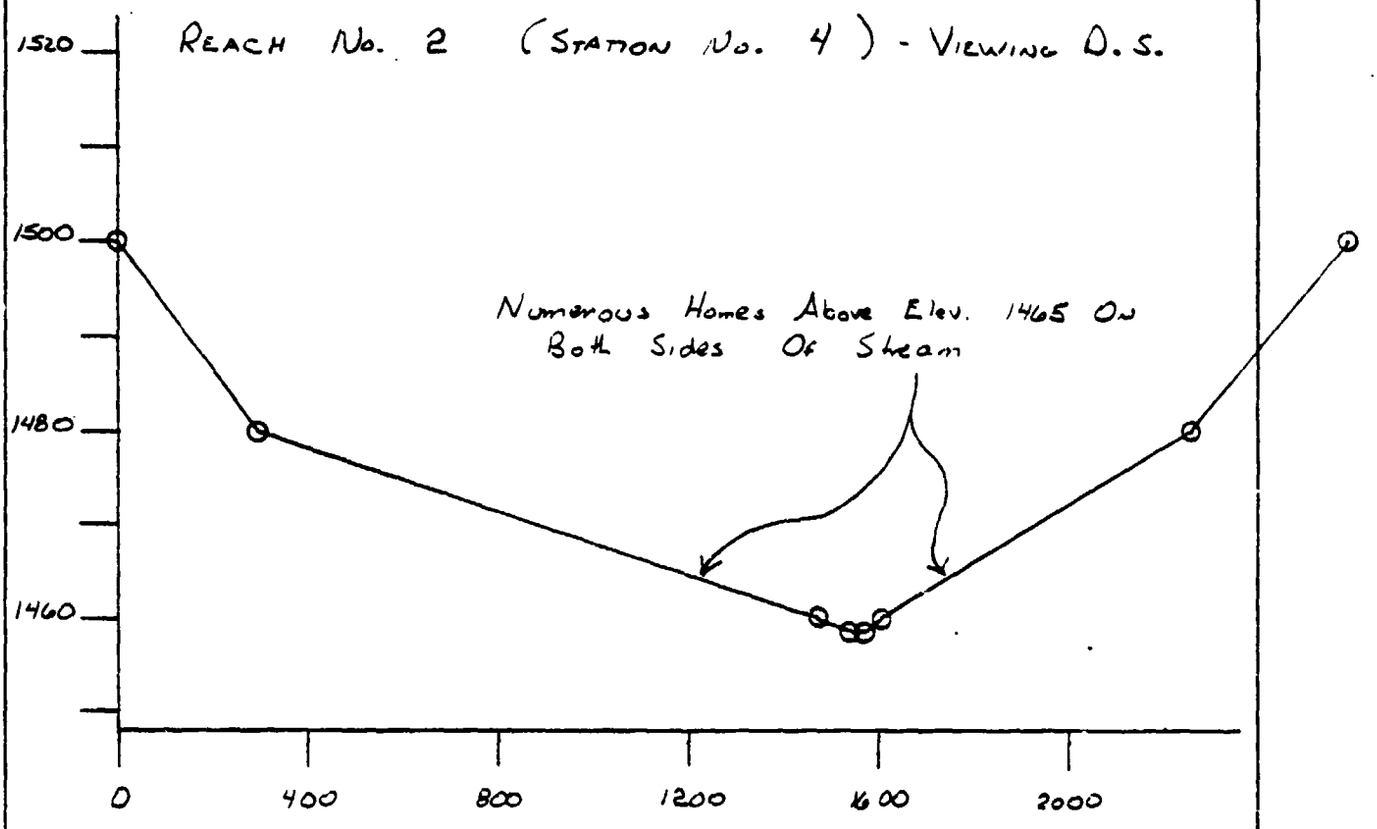
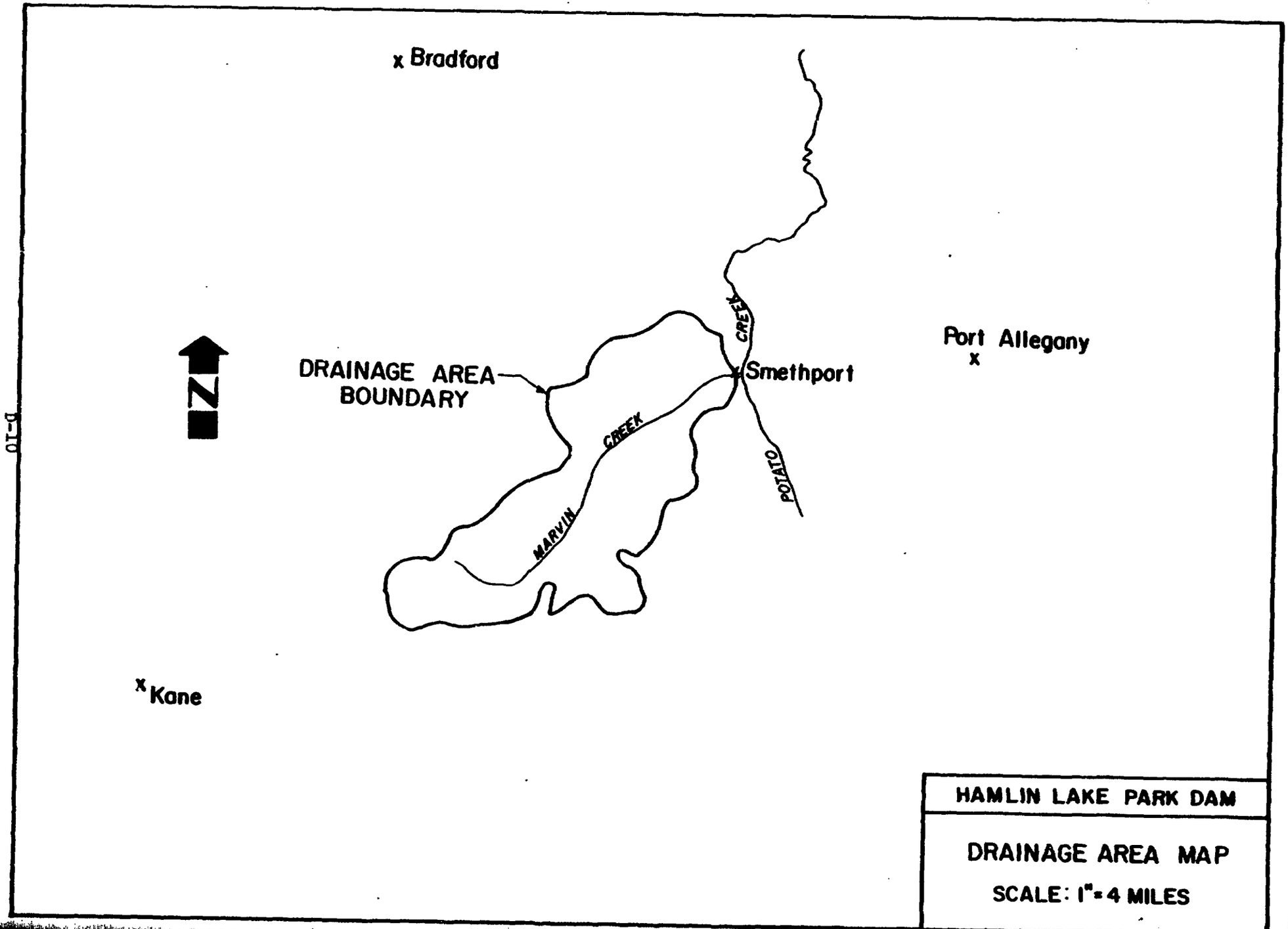
EBENSBURG PENNSYLVANIA

NAME
NUMBER PA-1014
SHEET NO. 5 OF 5
BY DGM DATE 7-81




x Bradford
DRAINAGE AREA BOUNDARY
Smethport
Port Allegany
x
CREEK
MARVIN
CREEK
POTATO
x Kane
HAMLIN LAKE PARK DAM
DRAINAGE AREA MAP
SCALE: 1" = 4 MILES

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
**********
     1  A1       ANALYSIS OF DAM OVERTOPPING USING RATIOS OF THE PMF
     2  A2       HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF HAMLIN PARK DAM
     3  A3       RATIOS OF THE PMF ROUTED THROUGH THE RESERVOIR
     4  B     150        0       30        0        0        0        0        0        0        0
     5  B1      5
     6  J       1        5        1
     7  J1     .1       .3       .5       .7        1
     8  K       0        1
     9  K1        INFLOW                                                  1
    10  M       1        1     56.7
    11  P                          1
    12  T              22.8       94      103      116      126                                1
    13  W    13.9     0.55                                              1.0     0.05
    14  X    -1.5     -.05      2.0
    15  K       1        2
    16  K1        ROUTE                                                 1
    17  Y
    18  Y1      1                          1        1
    19  Y4   1470     1471   1472.3     1473     1474     1475    -1470       -1
    20  Y5      0      870     3050     4540     7000     9780     12860    16200    19790    36360
    21  SA      0     27.6       34       83      162      340
    22  SE   1462     1470   1472.3     1485     1488     1500
    23  SS   1470
    24  SD1472.3      2.9      1.5       10
    25  SL     10      295      340      710      810
    26  SV1472.3     1474     1476     1478     1480
    27  K      99
```

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80

RUN DATE 81/07/13.
TIME 08.10.45.

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF THE PMF
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF HAMLIN PARK DAM
RATIOS OF THE PMF ROUTED THROUGH THE RESERVOIR

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	30	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1

RTIOS= .10 .30 .50 .70 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	56.70	0.00	56.70	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.80	94.00	103.00	116.00	126.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 13.90 CP= .55 NIA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=29.30 AND R=32.63 INTERVALS

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 13.99 HOURS, CP= .55 VOL= .93

10.	37.	78.	126.	181.	242.	307.	375.	448.	523.
600.	680.	762.	845.	930.	1013.	1090.	1161.	1225.	1282.
1334.	1379.	1417.	1448.	1472.	1489.	1497.	1496.	1484.	1454.
1412.	1369.	1328.	1288.	1249.	1211.	1174.	1139.	1105.	1071.
1039.	1008.	977.	948.	919.	891.	864.	838.	813.	788.
765.	742.	719.	697.	676.	656.	636.	617.	598.	580.
563.	546.	529.	513.	498.	483.	468.	454.	440.	427.
414.	402.	390.	378.	366.	355.	345.	334.	324.	314.
305.	296.	287.	278.	270.	262.	254.	246.	239.	231.
224.	218.	211.	205.	198.	192.	187.	181.	176.	170.

HYDROGRAPH ROUTING

ROUTE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1470.	-1

STAGE	1470.00	1471.00	1472.30	1473.00	1474.00	1475.00	1476.00	1477.00	1478.00
M 1482.00									
FLOW	0.00	870.00	3050.00	4540.00	7000.00	9780.00	12860.00	16200.00	19790.00
36360.00									
SURFACE AREA=	0.	28.	34.	83.	162.	340.			
CAPACITY=	0.	74.	144.	581.	1544.	4490.			
ELEVATION=	1462.	1470.	1472.	1480.	1488.	1500.			

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1470.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1472.3	2.9	1.5	10.

PEAK OUTFLOW IS 3510. AT TIME 53.00 HOURS

PEAK OUTFLOW IS 10533. AT TIME 52.50 HOURS

PEAK OUTFLOW IS 17557. AT TIME 52.50 HOURS

PEAK OUTFLOW IS 24581. AT TIME 52.50 HOURS

PEAK OUTFLOW IS 35118. AT TIME 52.50 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .30	RATIO 3 .50	RATIO 4 .70	RATIO 5 1.00
HYDROGRAPH AT	1	56.70 (146.85)	1	3513. (99.47)(	10539. 298.42)(	17564. 497.36)(	24590. 696.31)(	35128. 994.73)(
ROUTED TO	2	56.70 (146.85)	1	3510. (99.40)(	10533. 298.26)(	17557. 497.16)(	24581. 696.05)(	35118. 994.43)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1470.00	1470.00	1472.30
STORAGE	74.	74.	144.
OUTFLOW	0.	0.	3050.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1472.51	.21	152.	3510.	7.50	53.00	0.00
.30	1474.65	2.35	239.	10533.	32.50	52.50	0.00
.50	1476.02	3.72	308.	17557.	34.50	52.50	0.00
.70	1477.11	4.81	372.	24581.	36.00	52.50	0.00
1.00	1478.38	6.08	457.	35118.	37.50	52.50	0.00

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  01 APR 80
**********************************
    1              A1       RATIOS OF PMF ROUTED THROUGH THE RESERVOIR AND DOWNSTREAM
    2              A2       DOWNSTREAM CONDITIONS DUE TO OVERTOPPING OF HAMLIN PARK DAM
    3              A3       PLAN 1 ASSUMES BREACH. PLAN 2 ASSUMES NO BREACH
    4              B   150      0      30       0       0       0       0       0       0       0
    5              B1    5
    6              J     2      1       1
    7              JI  0.3
    8              K     0      1                                       1
    9              K1      INFLOW
   10              M     1      1    56.7                               1                       1
   11              P           22.8     94     103     116     126
   12              T                                                   1.0    0.05
   13              W  13.9   0.55
   14              X  -1.5   -.05     2.0
   15              K     1      2                                       1
   16              K1      ROUTE
   17              Y                                     1       1
   18              Y1    1                                                -1470      -1
   19              Y4 1470   1471  1472.3    1473    1474    1475    1476    1477    1478    1482
   20              Y5    0    870    3050    4540    7000    9780   12860   16200   19790   36360
   21              SA    0   27.6      34      83     167     340
   22              SE 1462   1470  1472.3    1480    1488    1500
   23              SS 1470
   24              SD1472.3    2.9     1.5      10
   25              SL   10    295     340     710     810
   26              SV1472.3   1474    1476    1478    1480
   27              SB   25    0.5    1464       2    1470  1473.3
   28              SB   25    0.5    1464       2    1470    1480
   29              K     1      3                                       1
   30              K1      MOD-PULS STREAM ROUTING (REACH 1)
   31              Y                                     1       1
   32              Y1    1
   33              Y6  .06    .05     .06    1462    1520     200   0.01
   34              Y7    0    1520     300    1500     500    1480    880    1462     900    1462
   35              Y7 1560    1480    1910    1500    2250    1520
   36              K     1      4                                       1
   37              K1      MOD-PULS STREAM ROUTING (REACH 2)
   38              Y                                     1       1
   39              Y1    1
   40              Y6  .06    .05     .06    1458    1500    2000  0.002
   41              Y7    0    1500     295    1480    1480    1460    1550    1458    1570    1458
   42              Y7 1610    1460    2270    1480.   2500    1500
   43              K    99
```

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .30
HYDROGRAPH AT	1	56.70 (146.85)	1	10539. (298.42)
			2	10539. (298.42)
ROUTED TO	2	56.70 (146.85)	1	10530. (298.16)
			2	10533. (298.26)
ROUTED TO	3	56.70 (146.85)	1	10531. (298.21)
			2	10533. (298.26)
ROUTED TO	4	56.70 (146.85)	1	10530. (298.18)
			2	10534. (298.29)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1470.00	1470.00	1472.30
STORAGE	74.	74.	144.
OUTFLOW	0.	0.	3050.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	1474.03	1.73	211.	10534.	24.46	52.67	45.50

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1470.00	1470.00	1472.30
STORAGE	74.	74.	144.
OUTFLOW	0.	0.	3050.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	1474.85	2.39	2393.	10533.	32.50	52.50	0.00

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	10531.	1468.7	53.00

PLAN 2 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	10533.	1468.7	52.50

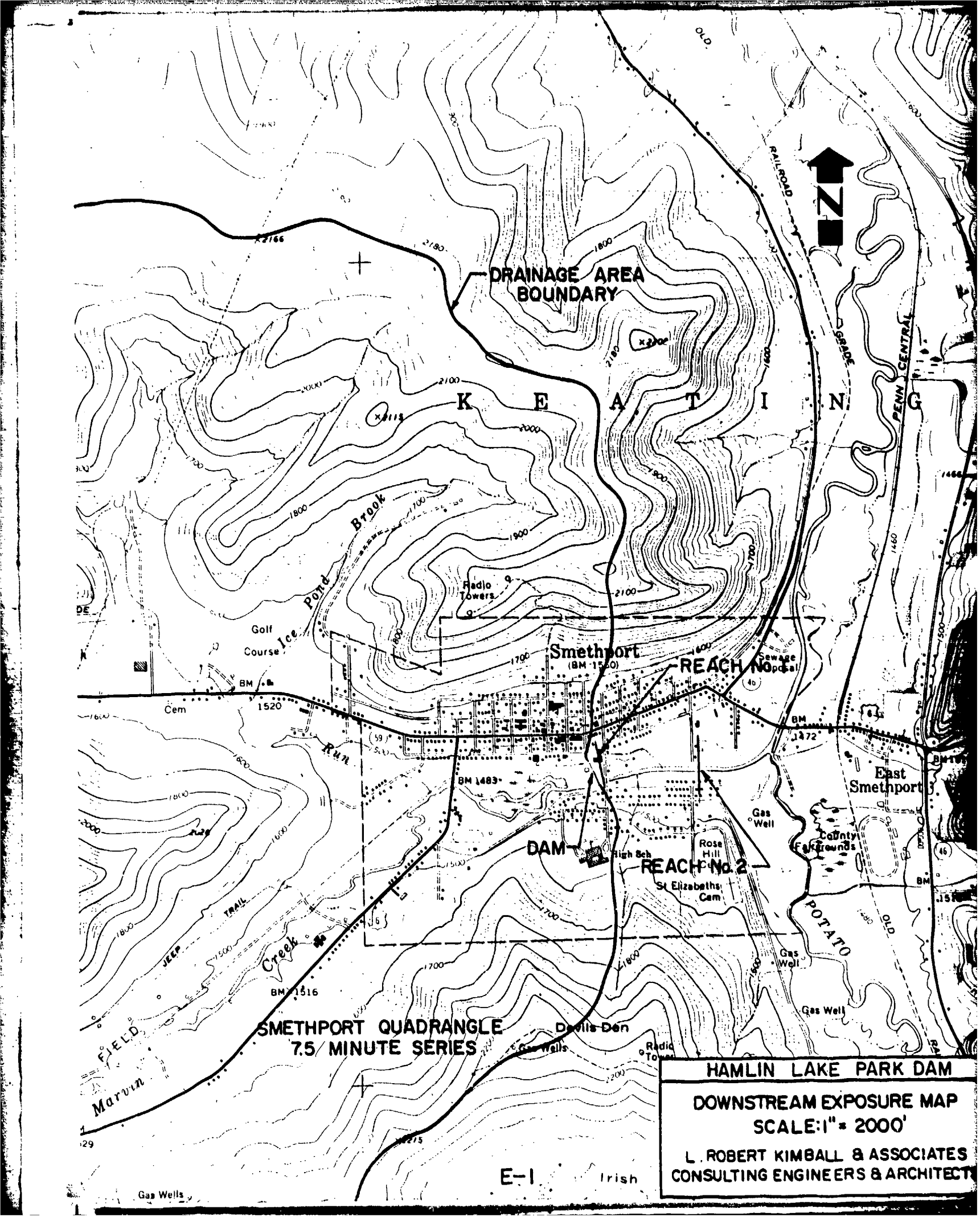
PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	10530.	1466.7	53.00

PLAN 2 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	10534.	1466.7	53.00

APPENDIX E
DRAWINGS

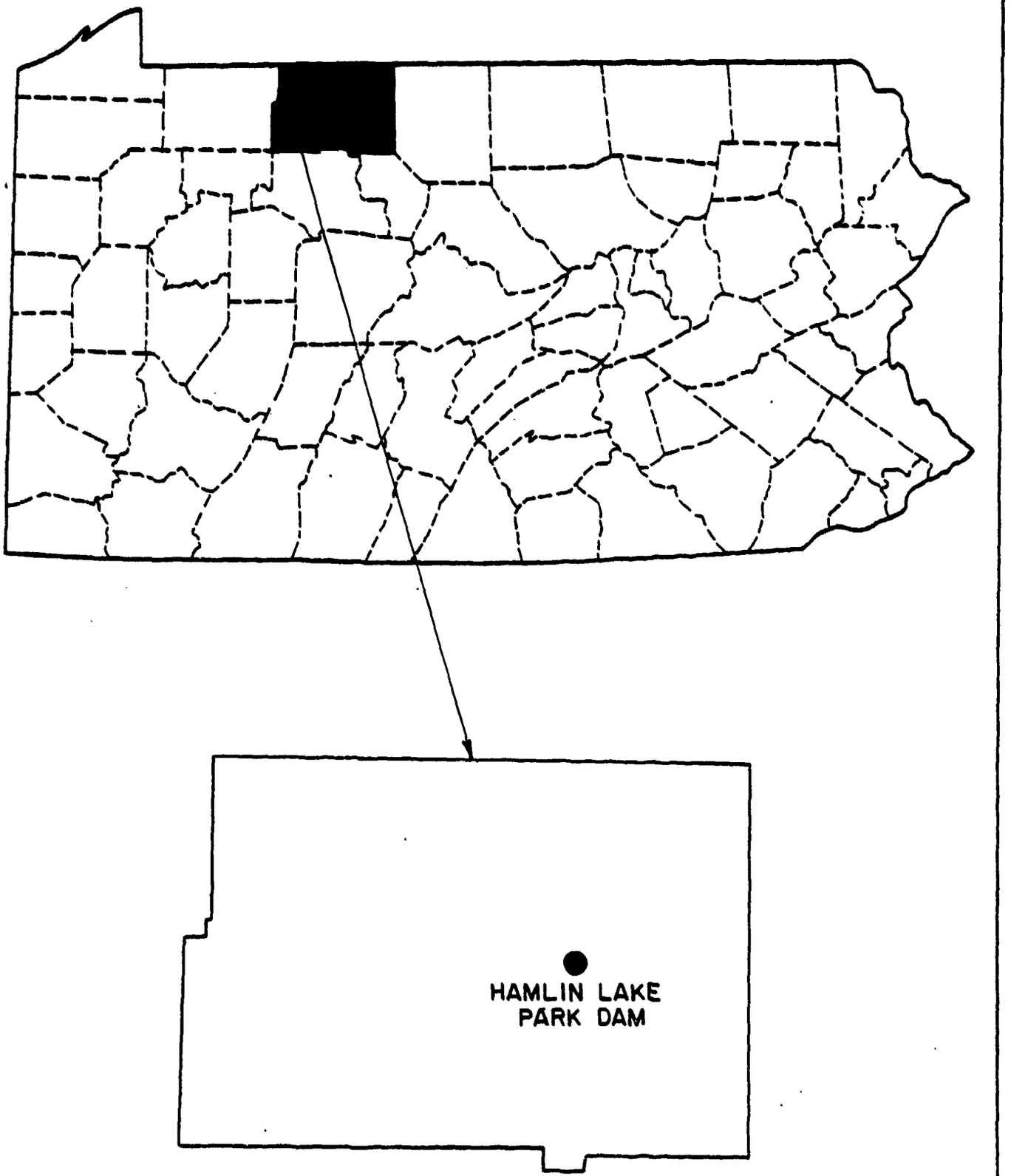


HAMLIN LAKE PARK DAM

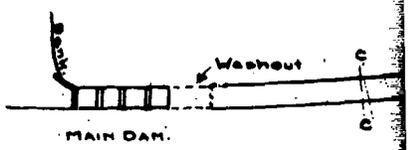
DOWNSTREAM EXPOSURE MAP

SCALE: 1" = 2000'

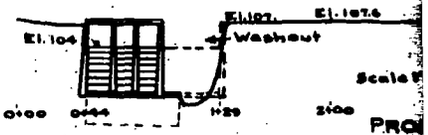
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

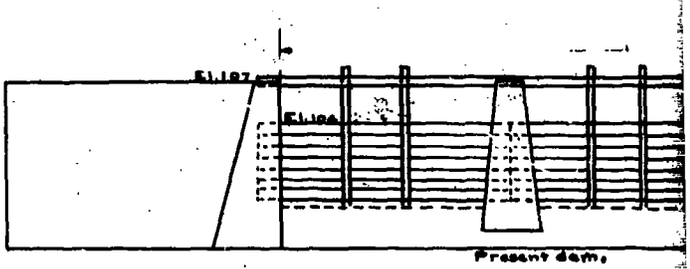


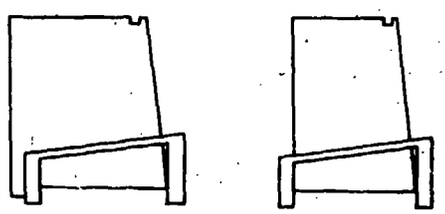
SITE LOCATION MAP
McKEAN COUNTY, PENNSYLVANIA

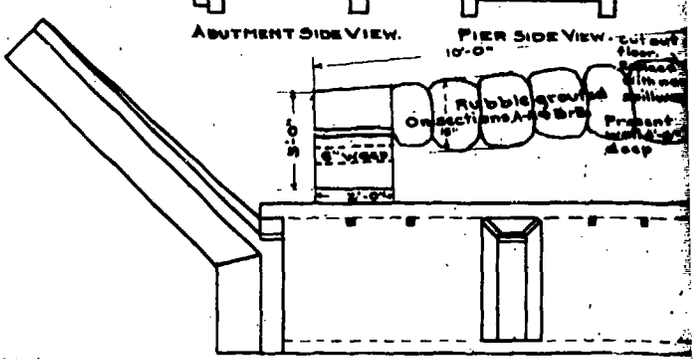


PLAN OF DYKE & DAM.
Scale 1"=20'



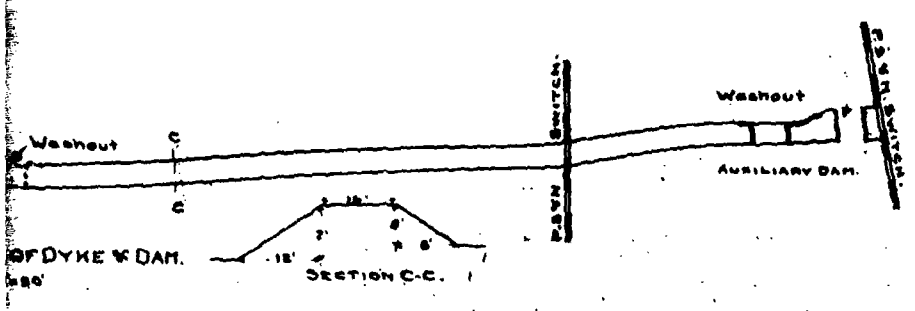




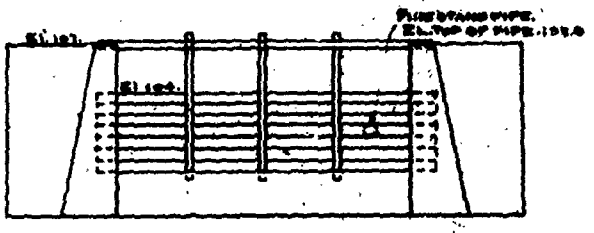


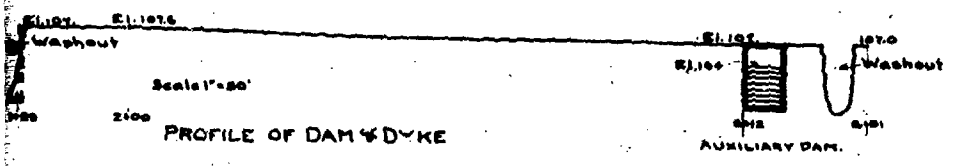
Note:-

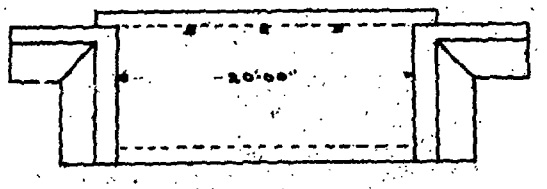
Present dam shown by solid lines.
Additions to dam shown by dotted lines.
Flood mark July 1942. El. 111.

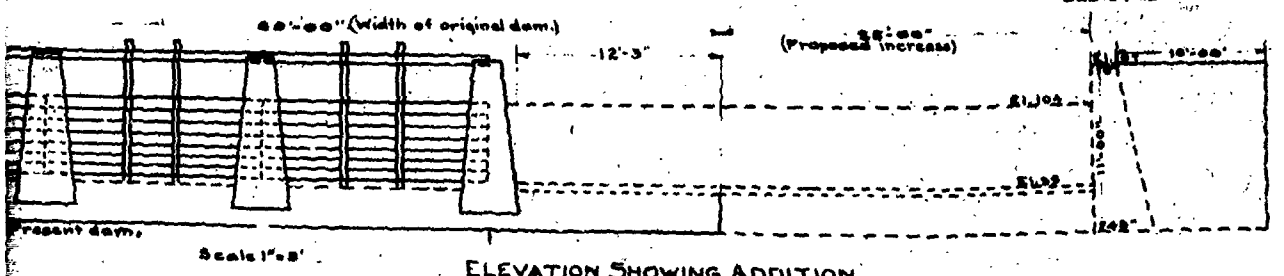


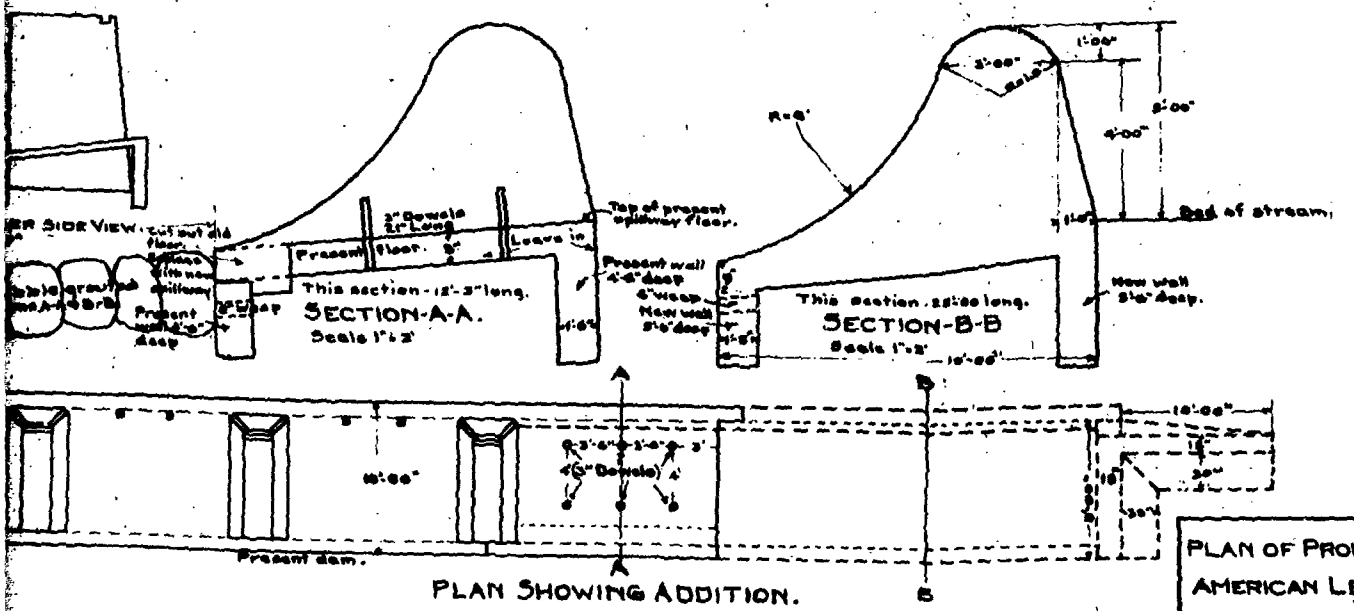
OF DYKE & DAM.







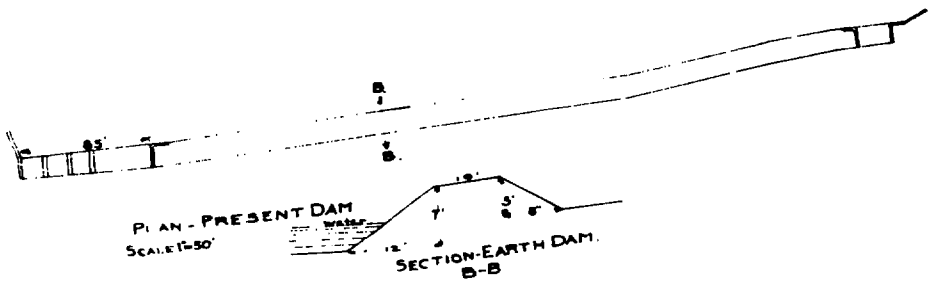


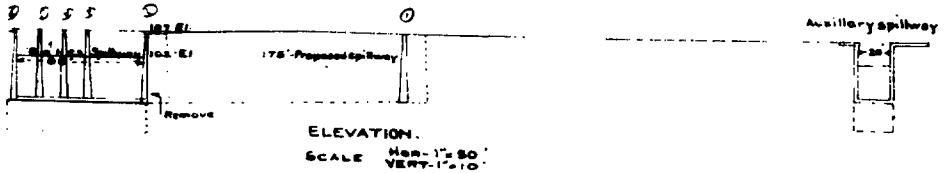


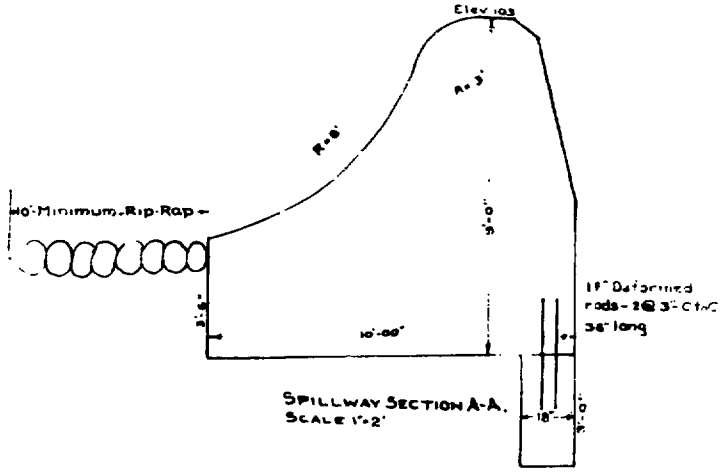
PLAN OF PROPOSED ADDITIONS.
AMERICAN LEGION PARK DAM.
SMETHPORT BORO-McKEAN CO. PA.
SCALES AS SHOWN. 8/1/48.
APPROVED.
FOR SMETHPORT BORO.

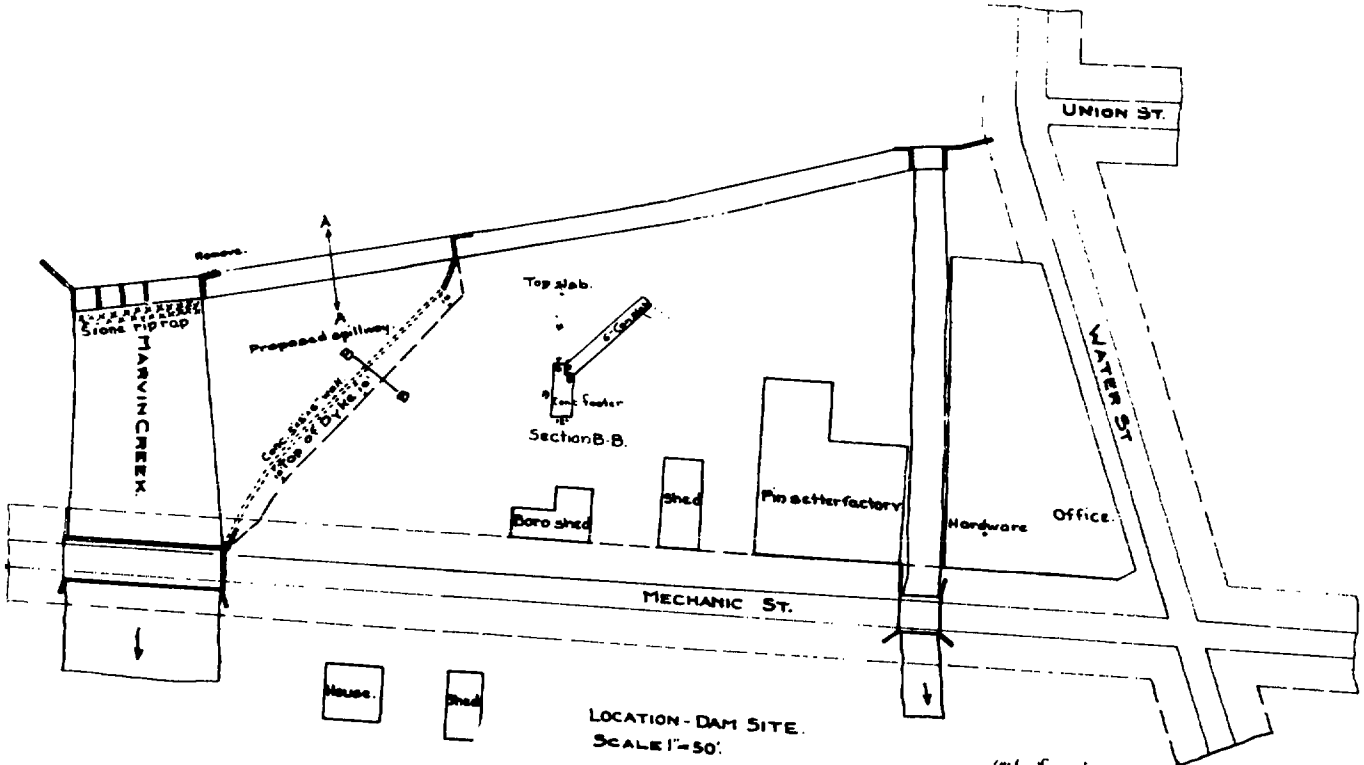
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

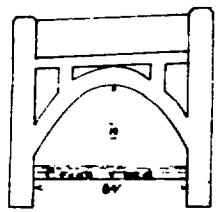
E-4











PLAN OF PROPOSED ADDITION.
SMETHPORT-BORO DAM.
SMETHPORT BORO-McKEAN CO. PA.

SCALES AS SHOWN. JUNE 27 1958

APPROVED BY. PRESIDENT OF COUNCIL.

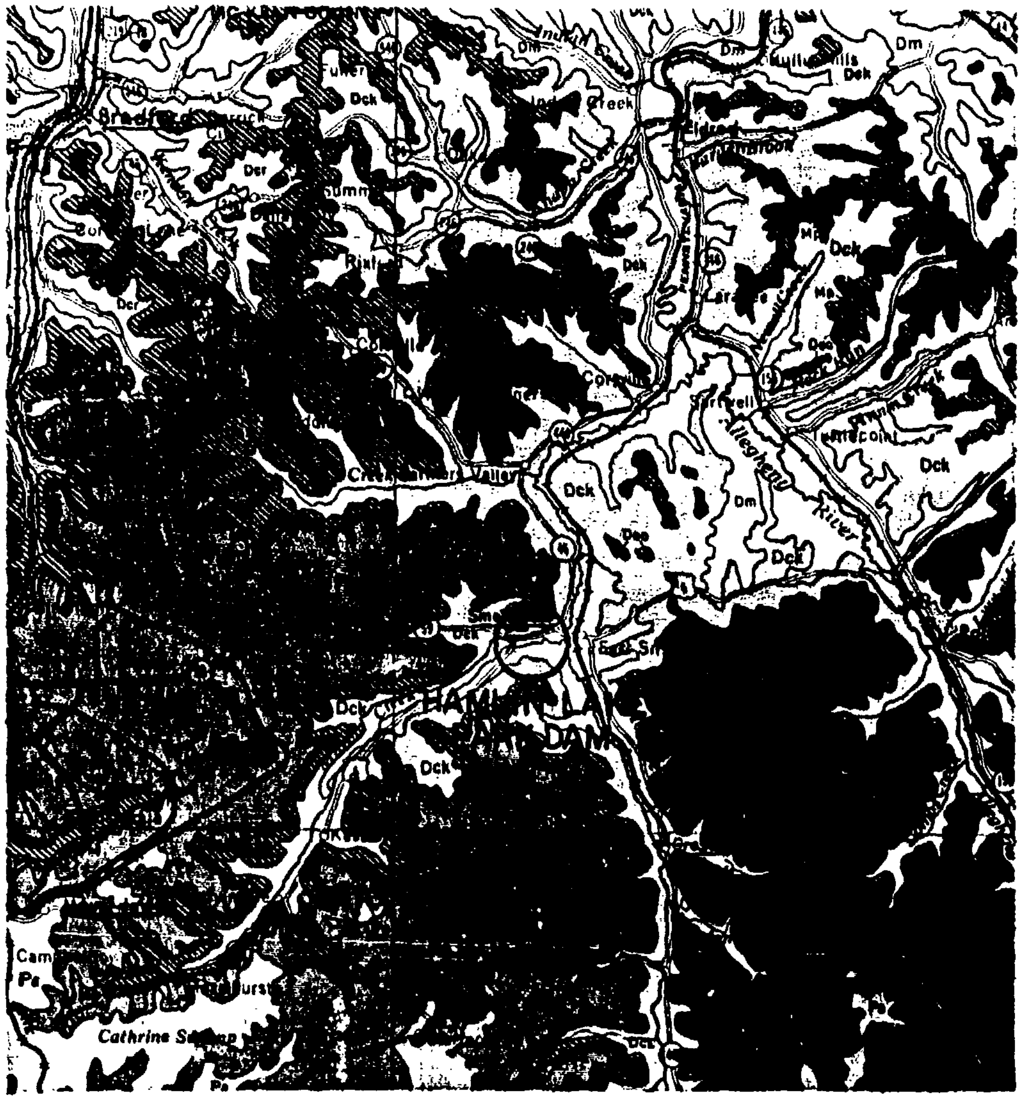
C^H Forsch Smethport Pa.
Regd Prof. Engr. Pennsa. #4308

APPENDIX F
GEOLOGY

General Geology

The Hamlin Lake Park Dam is located in the Allegheny High Plateaus Section of the Appalachian Plateau Province. Topographically, the area is a high, nearly flat plateau deeply dissected by streams. The Wisconsin glacier did not extend to the dam site as indicated by the lack of drift deposits or glacial lake deposits. The geologic structure is characteristic of Plateaus Province and comprises a series of folds trending northeast. The major structural features near the dam are the Smethport Anticline to the east and the Ormsby Syncline to the west. The strata locally dip to the northwest.

The bedrock underlying the dam and exposed in the nearby vicinity consists of marine beds of Devonian Age including shales, graywackes and sandstones. The Chemung and Portage beds are part of these strata. No major faulting is known in the study area.



GEOLOGIC MAP OF THE AREA AROUND THE HAMLIN LAKE PARK DAM

SCALE 1:250,000

DEVONIAN

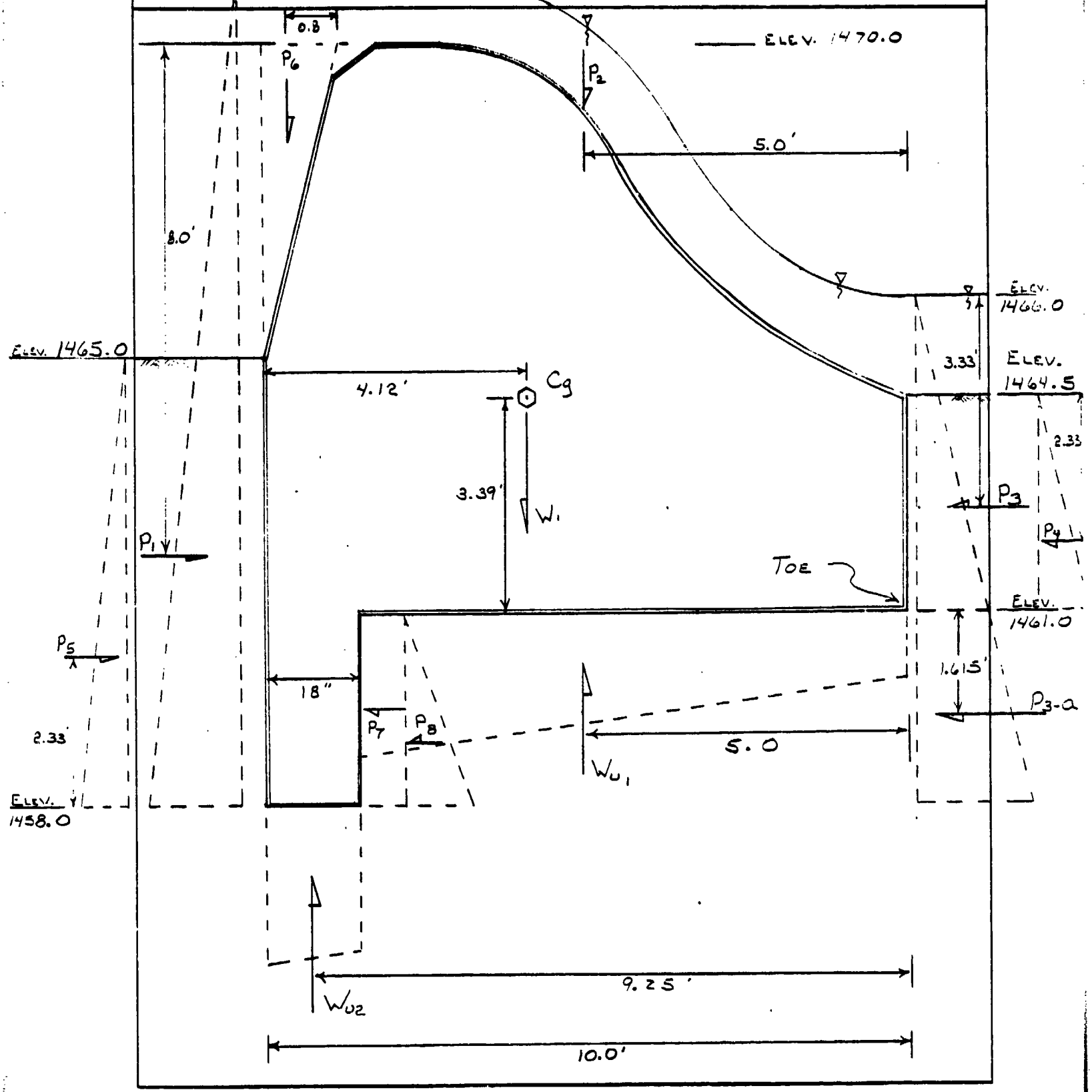
UPPER

Dm	**Marine beds** *Gray to olive brown shales, graywackes, and sandstones; contains "Chemung" beds and "Portage" beds including Burket, Brallier, Harrell, and Trimmers Rock; Tully Limestone at base*

APPENDIX G - STABILITY ANALYSIS

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

NAME HAMLIN LAKE SALE DAM
NUMBER PA-104
ELEV. 1471.0
SHEET NO. 1 OF 4
BY DGM DATE 7-81



L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

NAME Hamilton Lake Park Dam
NUMBER SA-1014
SHEET NO. 2 OF 4
BY DGM DATE 7-81

ASSUMPTIONS:

1. Unit Wt. Of Concrete Gravity Const. Material = 140pcf
2. Neglect Velocity Head
3. Unit Wt. Saturated Silt = 120 pcf
4. Structure Founded On Gravel, $f = 0.58$, $\tan^{-1} = 30°$
5. Unit Wt. For Saturated Gravel = 140 pcf
6. Angle Of Internal Friction For Silt = 30°
7. Assume Tailwater At 1466.0
8. Ignore Triangular Wedge Of Gravel Below Dam

WATER FORCES:

$P_1 = (12')^2 (1 FT)(62.4\ LBS/FT^3) / 2 = 4492.8\ LBS$ →
$P_2 = (10.5')(1' \times 1')(62.4\ LBS/FT^3) = 665.2\ LBS$ ↓
$P_3 = (5')^2 (1')(62.4\ LBS/FT^3) / 2 = 780.0\ LBS$ ←
$P_{3-a} = [(8')^2 (1')(62.4\ LBS/FT^3)/2] - 780.9 = 1216.8\ LBS$ ←
$P_6 = (5')(1' \times 1')(62.4\ LBS/FT^3)/2 = 156.0\ LBS$ ↓

SOIL FORCES:

$P_4 = \left(\frac{(120-62.4)(3.5)^2}{2}\right)\left(\frac{1+\sin 30}{1-\sin 30}\right) = 1,058.4\ LBS$ ←

$P_5 = \left(\frac{(120-62.4)(7.0)^2}{2}\right)\left(\frac{1-\sin 30}{1+\sin 30}\right) = 470.4\ LBS$ →

$P_7 = \left(\frac{9660\ LBS}{10'}\right)(3' \times 1')\left(\frac{1+\sin 30°}{1-\sin 30°}\right) = 8,694.0\ LBS$ ←

$P_8 = \left(\frac{(140-62.4)(3.0)^2}{2}\right)\left(\frac{1+\sin 30°}{1-\sin 30°}\right) = 1,047.6\ LBS$ ←

WEIGHT OF DAM:

$W_1 = (V)(\gamma) = [(69\ SF^2)(1\ SF)]\ (140\ LBS/FT^3) = 9,660\ LBS$ ↓

UPLIFT FORCE:

$$W_u = C\,\gamma_w [h_2 + \tfrac{1}{2} f (h_1 - h_2)] A$$

where $C = 2/3$ $\gamma_w = 62.4$ $f = 1.0$

$h_{1a} = (1471 - 1461) = 10\ FT$ $h_{2a} = (1466 - 1461) = 5\ FT$

$W_{U1} = \frac{2}{3}(62.4)[5 + \frac{1}{2}(1)(10-5)](8.5 \times 1) = 2,652.0$ lbs.

$h_{1B} = (1471 - 1458) = 13$ FT $\qquad h_{2B} = (1466 - 1458) = 8$ FT

$W_{U2} = \frac{2}{3}(62.4)[8 + \frac{1}{2}(1)(13-8)](1.5 \times 1) = 655.2$ lbs

(From: "Engineering For Dams"; 1945; Creager, Justin, & Hinds, pg. 267.)

STABILITY AGAINST SLIDING:

$$F.S. = \frac{[(W_1 + P_2 + P_6 - W_{U1} - W_{U2})(0.58)] + (P_3 + P_4 + P_7 + P_8)}{(P_1 + P_5)}$$

$$= \frac{[(960 + 665.2 + 156.0 - 2652.0 - 655.2)(0.58)] + (780 + 1058.4 + 8694 + 1,042.6)}{(4492.8 + 470.4)}$$

$= (15,740.92) / (4963.2) = \underline{3.17}$ (OK)

STABILITY AGAINST OVERTURNING ABOUT DOWNSTREAM TOE:

OVERTURNING MOMENT (M_o)

$M_o = P_1(1.0') + P_{3-a}(1.615') + P_7(1.5') + P_8(2.0') + W_{U1}(5') + W_{U2}(9.25')$

$= (4492.8) + (1216.8 \times 1.615) + (8694 \times 1.5) + (1042.6 \times 2) +$

$(2652 \times 5) + (655.2 \times 9.25) =$

$= 40,914.73$ FT-LBS

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

NAME Hamlin Park Lake Dam
NUMBER PA - 1014
SHEET NO. 4 OF 4
BY DGM DATE 7-31

Righting Moment (M_R)

$M_R = P_2(5') + P_3(1.67') + P_4(1.167') + P_5(0.667') + P_6(9.6) +$
$+ W_1(5.88')$

$= (665.2 \times 5) + (780 \times 1.67) + (1058.4 \times 1.167) + (470.4 \times 0.667)$
$+ (156.0 \times 9.6) + (9660 \times 5.88)$

$= 64,475.91$ FT-LBS

F.S. $= M_R / M_O = (64,475.91) / (40,914.73) = \underline{1.58}$ (OK)

$\Sigma V = P_2 + P_6 + W_1 - W_{U1} - W_{U2}$

$= (665.2 + 156.0 + 9660.0 - 2652.0 - 655.2) = 7,174$ LBS

$\Sigma M = (64,475.91) - (40,914.73) = 23,561.2$ FT-LBS +

$\Sigma M / \Sigma V = (23,561.2$ FT-LBS$) / (7174$ LBS$) = 3.28$ FT

$(1/3 \times 10) = 3.33'$ $(2/3 \times 10) = 6.67'$

∴ Resultant Is Not Within Middle Third!